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Review

Seroprevalence of markers for hepatitis B viral infection

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SUMMARY

Objectives: To provide a comprehensive review of the prevalence of selected hepatitis B virus (HBV) seromarkers and to identify variability in seroprevalence across the 14 World Health Organization (WHO) sub-regions and among special groups and populations.

Methods: Analyses involved 568 papers and 736 population studies. The complete data set included 21, 838, 249 individuals and covered the 14 WHO sub-regions.

Results: Of the 687 studies that assessed hepatitis B surface antigen (HBsAg) seroprevalence, 30% had low (<2% affected), 36% had intermediate (2–8% affected), and 34% had high (>8% affected) endemicity. Median HBsAg seroprevalence differed by selected populations and among geographic regions. Overall, median seroprevalence was highest for 'other' populations, followed by patients, then by pregnant women and children. Median seroprevalence of antibody to hepatitis B core antigen (anti-HBc) followed a similar endemicity pattern to that of HBsAg across the 14 WHO sub-regions. Median seroprevalence of hepatitis B e antigen (HBeAg) showed considerable variability within each population group, with the greatest potential for infectivity seen among children.

Conclusions: This population-based review provides a comprehensive assessment of the burden of HBV throughout the world. Significant differences in seroprevalence exist between WHO regions, study populations, and seromarker testing methods. The results presented in this study will enable health professionals to track worldwide reported seroprevalence of hepatitis B markers.

1. Introduction

Hepatitis is the name given to liver inflammation, which is usually caused by a viral infection, although it can also be caused by toxic agents or other diseases, such as autoimmune and metabolic diseases. The causative agent of viral hepatitis type B is the hepatitis B virus (HBV). The virus interferes with the normal functioning of the liver by replicating in hepatocytes. The response by the immune system to combat and potentially eliminate the infectious agent causes pathological damage and liver inflammation.[1] HBV infection is among the most common causes of hepatitis and can progress to serious liver diseases, such as chronic hepatic insufficiency, cirrhosis (scarring of the liver), and hepatocellular carcinoma.[1–3] About 25% of adults who are chronically infected during childhood will die from cirrhosis or liver cancer.[4]

Susceptibility to HBV is general, with immunity only in those who have been vaccinated or who have developed antibodies to hepatitis B surface antigen (anti-HBs) following HBV infection.[5] Infection with HBV frequently occurs in children and often leads to the person becoming a chronic carrier, where the virus is present in the blood and can be transmitted for many years, even if the infected person no longer has symptoms of the disease.[1–3] The virus is transmitted through contact with infected blood or body fluids.[2,6–8] It may spread from an infected mother to her child during the birth process, between children (especially where overcrowding is common), from a needle stick, or by sexual contact. HBV is also an occupational hazard among health workers.[6,7]

The course of HBV is variable, and the different clinical manifestations are influenced by the infected person's age and immune status. HBV occurs when there is a weak antiviral response, which is more common at a younger age of infection. Nearly 90% of HBV infected children during the first year of life develop chronic infections, 30%–50% of children infected in the age range 1–4 years develop chronic infection, and 90% of healthy adults who are infected will recover and be rid of the virus within six months.[9] HBV typically resolves within 3 months, but over 10% of cases become asymptomatic carriers or experience chronic HBV infection.[10] People who develop chronic HBV are at increased risk of developing cirrhosis and/or liver cancer.[11]

Acute hepatitis B has no specific treatment other than trying to maintain comfort and proper nutritional balance. Chronic hepatitis B may be treated with drugs. Drugs licensed for treating persons with chronic HBV include adefovir dipivoxil,[12] alpha-interferon,[13] lamivudine,[13] pegylated interferon,[14] entecavir,[15] telbivudine,[16] and tenofovir.[17]

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Of the approximately 2 billion people alive today who have been infected with HBV, nearly 350 million are chronically infected with HBV and are carriers of the virus.[3,7–9] However, this is likely an underestimation because high-risk populations may be underrepresented in surveillance studies and because of variability in testing methods.[10,14–16] In particular, estimates based on acute clinical hepatitis B may represent only part of the global burden associated with HBV, particularly in highly endemic areas where a large percentage of the population may become carriers while they are children.

The current study involved a systematic review of relevant published data documenting seroprevalence of HBV markers of infection and immunity at the regional and national level in the 14 WHO sub-regions. The prevalence of hepatitis B in various areas has previously been estimated.[17–21] Prevalence estimates in the current study provide updates to previous estimates of the prevalence of chronic HBV carriers in different populations throughout the world. Region-specific prevalence estimates of HBV are reported according to special groups and populations. The focus of this paper is on the identification of variability in prevalence of HBV seromarkers according to the 14 WHO sub-regions and special groups and populations.

2. Methods

2.1. Literature search

All published English and non-English language studies on hepatitis B seroprevalence published from January 1990 through July 2009 were identified from three electronic databases – MEDLINE, POPLINE, and BIDS (CAB ABS). A mixture of thesaurus and free-text terms was used. The search terms used to identify all relevant published data on MEDLINE and POPLINE are stated below. The search was carried out using the thesaurus, and any papers containing the terms below, not only in the title or abstract but also from the MeSH terms (index terms), were identified. This resulted in the identification of 3698 papers in total; the breakdown of the number of papers per search (i.e., hepatitis B and Europe, hepatitis B seroprevalence) is saved in the search history. This applies to all searches carried out on any database.

The following search terms were used: Hepatitis-B-Antigens/Hepatitis-B-Core-Antigens/Hepatitis-B-Surface-Antigens/Hepatitis-B-e-Antigens/Hepatitis-B/Hepatitis-B-Antibodies/Hepatitis-B-Chronic/Africa/Asia, Middle East/Mediterranean/Americas, Europe, Prevalence/Disease-Transmission-Horizontal/Epidemiology.

2.2. Inclusion and exclusion criteria

All articles published between January 1990 and July 2009 containing data on HBV seroprevalence were considered for inclusion. Studies were excluded if they were reviews and did not contain primary data, were non-referenced sources, were letters/correspondence, or were not relevant and/or did not contain primary seroprevalence data. Studies were also excluded if they were studies of occult hepatitis B in which all participants were seronegative for hepatitis B.

2.3. Quality criteria

Each reviewed paper was assigned a quality score. All papers were categorized as good, reasonable–good, poor–reasonable, or poor based on three main criteria: sample size, method of sampling, and response rate. The main quality criterion when critically reviewing the papers was the method of sampling. The sample population must be representative of the source population for the results to be valid. Random sampling is the gold standard of sampling because it ensures that chance alone determines who is included in the sample, greatly minimizing the possibility of selection bias. However, selection bias may also be introduced into the study if those who participate differ in significant ways from those who refuse, therefore high response rates (>80%) are important in order to minimize selection bias. Sample size was also factored into the assigned quality score. A sample size of 150 or more was determined to be adequate.

If the method of sampling was random, the response rate was greater than 80%, the sample size was at least 150, and measures had been taken to minimize other forms of bias, the study was categorized as 'good.' If one of these three criteria was not met or the methods employed in the study were deemed likely to result in some bias, the study was categorized as 'reasonable.' If two of the criteria were not met, or if the study was based on small numbers or an unrepresentative study population and there were serious concerns about bias, it was categorized as 'poor.' We found that many of the studies did not report the response rate. These studies were rated down a degree of quality and assigned scores of, for example, reasonable–good and poor–reasonable.

Two people reviewed a random sample of 25% of the studies in order to ensure consistency in the quality grading assigned to the studies. There was complete agreement on the quality grading of papers reviewed by both researchers.

2.4. Classification of studies

Hepatitis B prevalence studies were included in this report, regardless of the study design employed.

2.5. Classification of countries

Countries were grouped according to the six WHO regions: The African Region (AFR), the Region of the Americas (AMR), the Eastern Mediterranean Region (EMR), the European Region (EUR), the South-East Asia Region (SEAR), and the Western Pacific Region (WPR). These regions were further divided into 14 sub-regions based on level of mortality within each country. Those countries whose sub-region assignment ends in 'A' have the lowest mortality and those whose sub-region assignment ends in 'E' have the highest mortality. Appendix A in the Supplementary Material lists the WHO Member States by region and mortality stratum.

2.6. Information abstracted

Serological markers of HBV infection and immunity abstracted for this study included hepatitis B surface antigen (HBsAg), antibody to hepatitis B core antigen (anti-HBc), and hepatitis B e antigen (HBeAg). HBsAg is the surface antigen of the virus and if present indicates either acute or chronic HBV infection; anti-HBc is an antibody to the hepatitis B core antigen and indicates acute, chronic, or resolved HBV infection; and HBeAg is a marker of high HBV infectivity, correlates with HBV replication, and is primarily used to assess patients with chronic HBV infection.

Serological prevalence data for these markers represented several populations. The most frequently identified populations included the general population, adults, children, pregnant women, and blood donors. Classifications used for the marker HBsAg were high (>8%), intermediate (2–8%), and low (<2%).[8] Several special populations were also identified, including patients, children of HBsAg-positive mothers, non-injection drug users, prison staff, college students, medical/hospital employees, migrants, street adolescents, and military recruits. HIV-positive patients were included in the 'patients' category. Some specific racial/ethnic groups identified were Baka Pygmies, Bushmen,

Amerindian, Cigane, Gypsies, Nicobarese, Shompens, Onges, Andamanese, and Aborigines.

HBeAg measures are based on positive cases among HBsAg individuals. The testing method used for each marker was also abstracted. Information about vaccination interventions was included and classified into the following five categories: (1) 'n/c', meaning no comment was made about vaccination interventions in the article; (2) 'prior', meaning the purpose of the study was to establish baseline data for a vaccination intervention; (3) 'post', meaning the purpose of the study was to evaluate a vaccination intervention; (4) 'recommend', meaning the article recommended that vaccination interventions should be a priority based on study results; and (5) 'concurrent', meaning that study results were partially attributed to ongoing vaccination interventions.

2.7. Data consistency check

There were 279 studies that reported prevalence estimates for both the serological markers HBsAg and anti-HBc. The latter marker should not exceed the former. However, in seven of the 279 studies (2.5%), HBsAg had higher prevalence estimates than did anti-HBc. This situation has been observed previously in non-outbreak populations when there is a large number of false-positive HBsAg. We assigned a quality score of poor to these studies.

2.8. Statistical analysis

Data were entered into Excel spreadsheet files and analyzed in Excel and Statistical Analysis System (SAS) software, version 9.2 (SAS Institute Inc., Cary, NC, USA, 2007). Seroprevalence scores reflect the percentage of the population affected by the selected markers of HBV. Because seroprevalence scores were highly skewed, median scores were reported in this study, and evaluated using the Kruskal–Wallis test and the Wilcoxon rank-sum test. Seroprevalence scores were weighted according to the quality index score (i.e., poor = 1, poor/reasonable = 2, reasonable = 3, reasonable/good = 4, and good = 5). Regression analysis was used to evaluate whether there was a trend in median seroprevalence from 1990 through 2009. Because median seroprevalence did not significantly vary for HBsAg (slope = −0.07, $p = 0.362$), anti-HBc (slope = −0.05, $p = 0.935$), or HBeAg (slope = −0.04, $p = 0.948$), analyses were based on data combined over the study period.

3. Results

The literature search identified 708 studies for review. Of these, 140 were excluded, leaving 568 (of which 99 were non-English) papers that met the inclusion criteria. Some of the papers assessed more than one group, resulting in data on 736 populations. A line listing of selected information for each of the 568 papers is provided in the Supplementary Material (Appendix B). The information in this table is grouped by WHO sub-region according to seroprevalence of HBV markers of infection and immunity. A brief description of the studies is given in terms of country, source, year, population studied, sample size, data quality, age range, markers, testing method, and vaccination. Prevalence estimates were most frequently reported for HBsAg ($n = 687$), followed by anti-HBc ($n = 327$) and then HBeAg ($n = 107$). Seroprevalence studies of HBeAg were less likely to involve adults and more likely to involve pregnant women. Journal citations for the studies are shown in the Supplementary Material (Appendix C).

Nearly all the studies represented in this report were based on a cross-sectional study design ($n = 724$, 98.4%). A small number of studies estimated prevalence using either case–control ($n = 5$, 0.7%) or cohort study ($n = 7$, 1.0%) designs.

The distribution of quality scores for the studies was 9% poor, 14% poor/reasonable, 30% reasonable, 9% reasonable/good, and 38% good.

Comments on vaccination intervention were found in 54% of the papers. In 12% of the studies the purpose was to establish baseline data prior to vaccination intervention; in 16% of the studies the purpose was to evaluate a vaccination intervention; in 65% of the studies vaccination interventions were recommended as a priority based on study results; and in 7% of the studies the results were partially attributed to ongoing vaccination interventions.

3.1. Seroprevalence of HBsAg

Of the 687 studies that assessed HBsAg seroprevalence, 30% had low (<2% affected), 36% had intermediate (2–8% affected), and 34% had high (>8% affected) endemicity. HBsAg seroprevalence according to endemicity is presented for each of the 14 WHO sub-regions in Table 1. Median HBsAg seroprevalence significantly differed among geographic regions (Kruskal–Wallis Chi-square, $p < 0.001$). Geographic regions reflecting high endemicity include Africa, high-mortality developing Eastern Mediterranean, parts of Eastern Europe, and developing Western Pacific; geographic regions reflecting intermediate endemicity include low-mortality developing Eastern Mediterranean, parts of Eastern Europe, and South-East Asia; and geographic regions reflecting low endemicity include the Americas, Western Europe, and developed Western Pacific.

Median seroprevalence estimates of HBsAg are reported according to selected populations and WHO regions grouped according to endemicity (Table 2). Overall, median seroprevalence was highest for 'other' populations, followed by patients, and then by pregnant women and children. Within group 1 (high endemicity areas) there was no significant difference among the populations; in group 2 (intermediate endemicity areas) there was a significant difference among the populations, with median HBsAg seroprevalence greatest in the 'other' category and patients and children; and in group 3 (low endemicity areas) there was also a significant difference among the populations, with median seroprevalence of HBsAg greatest in the 'other' category and patients, but among the lowest in children. Median seroprevalence estimates of HBsAg did not significantly differ among the three age groups for children overall or within endemicity groups.

Table 1
Median HBsAg seroprevalence and the distribution of study scores within each of the 14 WHO sub-regions

			Endemicity,[a] %			
	No.	Median (%)[b]	Low, %	Medium, %	High, %	Unknown, %
AFR-D	83	14	5	19	74	2
AFR-E	44	10.7	2	32	61	5
WPR-B	109	9.5	5	33	56	6
EUR-B	52	7.5	2	52	46	0
EUR-C	17	5.1	24	41	29	6
EMR-D	25	4.6	12	44	44	0
SEAR-B	17	4.3	29	47	24	0
SEAR-D	84	3.7	24	57	19	0
EMR-B	42	3	21	60	7	12
AMR-B	89	1.2	51	30	11	8
WPR-A	28	1	50	32	7	11
AMR-D	7	0.9	43	14	0	43
AMR-A	37	0.8	54	19	11	16
EUR-A	102	0.7	72	9	6	13

HBsAg, hepatitis B surface antigen; WHO, World Health Organization.
[a] Low means <2% affected, intermediate means 2–8% affected, and high means >8% affected.
[b] Weighted by study quality scores and expressed as percentages. Kruskal–Wallis Chi-square = 282, $p < 0.001$.
Percentages sum to 100 by row.

Table 2
Median seroprevalence estimates of HBsAg according to selected populations and WHO regions grouped according to endemicity

		Endemicity,[a] %			Group 1[b]		Group 2[c]		Group 3[d]	
	Median (%)[e]	Low	Medium	High	No.	Median (%)[e]	No.	Median (%)[e]	No.	Median (%)[e]
General (all ages)	4.3	29	39	32	31	13.6	41	6.7	34	0.9
General (adults)	2.6	44	30	26	27	8.2	16	4.5	31	0.9
Blood/tissue donors	2.6	42	31	27	29	11.1	46	4.4	30	0.3
Pregnant women	4.3	37	35	28	36	9.9	34	5.2	38	0.7
Children	4.1	34	28	38	56	11.1	34	7.4	24	0.4
Patients	5.6	16	48	36	21	14.0	32	7.9	24	2.6
Other[f]	7.0	18	38	44	27	10.8	31	16.0	46	3.1
Kruskal–Wallis Chi-square *p*-value	0.001					0.306		0.002		<0.001

HBsAg, hepatitis B surface antigen; WHO, World Health Organization.
[a] Low means <2% affected, intermediate means 2–8% affected, and high means >8% affected.
[b] Group 1: AFR-D, AFR-E, WPR-B.
[c] Group 2: EMR-B, EMR-D, EUR-B, EUR-C, SEAR-B, SEAR-D.
[d] Group 3: AMR-A, AMR-B, AMR-D, EUR-A, WPR-A.
[e] Weighted by study quality scores.
[f] Studies involving selected groups such as drug users, prison officers and staff, college students, migrants, street children, refugees, nursing home residents, military recruits, female sex workers, healthcare workers, and other special populations.

The 'other' category consisted of several special groups and populations that involved insufficient numbers to group into large categories. Seroprevalence of HBsAg is presented for selected groups and special populations in the Supplementary Material (Appendix D, Figures 1 and 2, respectively). The highest endemicity is observed in newborns of HBsAg-positive mothers, family members of chronic HBsAg patients/individuals, and drug users. In addition, several special populations display high endemicity, particularly tribal groups in India and Afghan refugees in Iran.

Seroprevalence of HBsAg for studies involving patients is presented in the Supplementary Material (Appendix D, Figure 3). Several types of patient are represented in the figure. The highest HBsAg seroprevalence is among the studies involving liver disease patients.

There were 27 studies that were classified according to urban–rural settings (12 urban and 15 rural). Of these studies, 23 provided seroprevalence data on HBsAg. Fifteen of these studies focused on the general population, two on pregnant women, two on primary school children, two on adolescents, and two on college students; 14 of the studies were conducted in AFR, eight were conducted in WPR, and one was conducted in AMR. Median seroprevalence was not significantly different between urban and rural settings (Wilcoxon $Z = -1.02$, $p = 0.306$).

A high number of studies failed to identify vaccination status, thereby limiting our evaluation of HBsAg seroprevalence by vaccination classification. The level of studies not commenting on vaccination status was high across all 14 WHO sub-regions.

3.2. Seroprevalence of anti-HBc

Median seroprevalence of anti-HBc, weighted by the study quality scores, follows a similar pattern to that of HBsAg across the 14 WHO sub-regions (i.e., 56.2% for AFR-E, 50.2% for AFR-D, 41.0% for WPR-B, 37.8% for EUR-B, 32.4% for SEAR-D, 31% for EMR-D, 29.7% for WPR-A, 25% for SEAR-B, 18.7% for EMR-B, 15% for AMR-A, 14% for EUR-C, 13.9% for AMR-B, 11.6% for AMR-D, and 7% for EUR-A). Median seroprevalence estimates of anti-HBc are reported according to selected populations and WHO regions grouped according to endemicity in Table 3. Patients and those in the 'other' populations experienced the highest anti-HBc and blood/tissue donors had the lowest anti-HBc seroprevalence. Anti-HBc seroprevalence was least similar among the endemicity groups for adults who were blood/tissue donors.

Difference scores between the seroprevalence of anti-HBc and HBsAg were derived for the 278 studies that collected information on both markers. Median difference scores weighted by the quality score were similar among the WHO sub-regions in endemicity group 1 (Kruskal–Wallis Chi-square = 3.0, $p = 0.224$) and group 2 (Kruskal–Wallis Chi-square = 7.5, $p = 0.184$), but not group 3 (Kruskal–Wallis Chi-square = 10.1, $p = 0.039$). Median difference scores (anti-HBc seroprevalence subtracted by HBsAg seroprevalence) for the three groups were 39, 17.1, and 8.2 (23.6 in WPR-A, 13.1 in AMR-B, 8.2 in AMR-A, 6.8 in EUR-A, and 2.9 in AMR-D), respectively. In addition, median difference scores weighted by the quality score were 13.8 in the general adult population, 9.5 in

Table 3
Median seroprevalence estimates of anti-HBc according to selected populations and WHO regions grouped according to endemicity

		Group 1[a]		Group 2[b]		Group 3[c]	
	Median (%)[d]	No.	Median (%)[d]	No.	Median (%)[d]	No.	Median (%)[d]
General (all ages)	21.4	16	38.2	17	31.0	26	8.8
General (adults)	13.2	20	53.6	8	16.4	24	7.5
Blood/tissue donors	11.0	6	57.4	10	18.7	16	5.3
Pregnant women	25.3	9	56.2	7	28.5	12	7.1
Children	12.8	29	15.6	12	15.8	17	3.7
Patients	38.5	14	77.5	8	28.6	17	19.9
Other[e]	27.5	9	57.9	7	68.8	42	19.0
Kruskal–Wallis Chi-square *p*-value	0.001		0.006		0.047		<0.001

anti-HBc, antibody to hepatitis B core antigen; WHO, World Health Organization.
[a] Group 1: AFR-D, AFR-E, WPR-B.
[b] Group 2: EMR-B, EMR-D, EUR-B, EUR-C, SEAR-B, SEAR-D.
[c] Group 3: AMR-A, AMR-B, AMR-D, EUR-A, WPR-A.
[d] Weighted by study quality scores.
[e] Studies involving selected groups such as drug users, prison officers and staff, college students, migrants, street children, refugees, nursing home residents, military recruits, female sex workers, healthcare workers, and other special populations.

Table 4
Median seroprevalence estimates of HBeAg among HBsAg-positive cases according to selected populations and WHO regions grouped according to endemicity

		Group 1[a]		Group 2[b]		Group 3[c]	
	Median (%)[d]	No.	Median (%)[d]	No.	Median (%)[d]	No.	Median (%)[d]
General (all ages)	20.0	6	25.0	1	20.0	1	5.7
General (adults)	17.9	6	21.5	0		3	4.3
Blood/tissue donors	16.3	2	16.3	0		0	
Pregnant women	14.0	16	15.3	18	12.0	7	16.7
Children	22.9	14	22.9	4	0.0	3	67.0
Patients	26.7	3	27.3	1	26.0	0	
Other[e]	36.6	6	47.8	3	36.6	8	20.0
Kruskal–Wallis Chi-square *p*-value	0.023		0.233		0.195		0.127

HBeAg, hepatitis B e antigen; HBsAg, hepatitis B surface antigen; WHO, World Health Organization.
[a] Group 1: AFR-D, AFR-E, WPR-B.
[b] Group 2: EMR-B, EMR-D, EUR-B, EUR-C, SEAR-B, SEAR-D.
[c] Group 3: AMR-A, AMR-B, AMR-D, EUR-A, WPR-A.
[d] Weighted by study quality scores.
[e] Studies involving selected groups such as drug users, prison officers and staff, college students, migrants, street children, refugees, nursing home residents, military recruits, female sex workers, healthcare workers, and other special populations.

blood/tissue donors, 17.0 in pregnant women, 10.0 in children, 30.0 in patients, and 23.3 in the 'other' populations (Kruskal–Wallis Chi-square = 20.4, $p = 0.002$).

3.3. Seroprevalence of HBeAg

Median seroprevalence of HBeAg among HBsAg-positive cases is reported according to selected populations and endemicity groups in Table 4. Small numbers caused differences of HBeAg seroprevalence among the selected populations to be statistically insignificant within endemicity groups, but not overall. HBeAg seroprevalence across the WHO sub-regions varied considerably (47.8% for WPR-B, 35.4% for AMR-A, 28.3% for SEAR-B, 22% for SEAR-D, 20.7% for AMR-B, 16.7% for EUR-A, 16.3% for AFR-D, 15.8% for WPR-A, 13.9% for EUR-C, 13.8% for EMR-B, 12.3% for AFR-E, 8.9% for EUR-B, and 0% for EMR-D). The high score for each group came from the WHO sub-region WPR-B. HBeAg seroprevalence for selected populations within this sub-region are presented in the Supplementary Material (Appendix D, Figure 4).

3.4. Testing methods

Several testing methods were identified in the studies reviewed. The frequency of their use according to the seroprevalence markers is presented in Table 5. The table also presents the median seroprevalence estimate for the various markers and testing methods. The frequency of testing method varied considerably, with the enzyme-linked immunosorbent assay (ELISA) used most frequently. The percentage of studies using ELISA was more common when the marker HBsAg was being evaluated compared with HBeAg and anti-HBc. Reverse passive hemagglutination (RPHA) was also used more frequently for evaluating HBeAg compared with the other markers. The median scores were lowest in the 'not specified' (NS) group for HBsAg and highest in the NS group for HBeAg and anti-HBc. The high percentage of NS for each of the seroprevalence markers made it impossible to evaluate significant differences among the testing methods. A higher percentage of NS by region, as high as 67% in one region, also made it impossible to evaluate whether the use of testing methods varied according to region.

4. Discussion

The current study identified 736 studies from 568 papers on HBV. Of these studies, seroprevalence estimates for HBsAg, anti-HBc, and HBeAg were available in 687, 327, and 107 studies, respectively. The studies represent 21 838 249 individuals. The review covers 20 years of data. Special populations considered include the general population (adults, children), blood donors, pregnant women, patients, and other populations. Descriptive information is provided on each of these populations, along with detailed information on those groups in the category designated as 'other' populations. Information on vaccination, testing method, and year of the study also adds to the completeness of this review. It is interesting to note that our analysis was not able to identify a significant global trend from 1990 to 2009 for HBsAg, HBeAg, or anti-HBc seroprevalence, despite the mass vaccination efforts that have been conducted during this time period. However, previous studies have indicated that a lack of temporal variability in seroprevalence may be due to decreasing worldwide seropreva-

Table 5
Number and percentage of studies using specific testing methods according to seroprevalence marker

	HBsAg			HBeAg			Anti-HBc		
	No.	%	Median (%)[a]	No.	%	Median (%)[a]	No.	%	Median (%)[a]
ELISA	290	42	3.8	36	34	18.2	119	37	14.9
EIA	129	19	6.1	31	29	21.3	71	22	19.3
RPHA	54	8	5.8	2	2	12.3	0	0	0
RIA	48	7	5.6	17	16	16.7	57	18	26.8
Other[b]	86	13	3.9	11	10	16.7	41	13	12.0
NS	80	12	3.6	9	9	47.8	36	11	32.7

HBsAg, hepatitis B surface antigen; HBeAg, hepatitis B e antigen; anti-HBc, antibody to hepatitis B core antigen; ELISA, enzyme-linked immunosorbent assay; EIA, enzyme immunoassay; RPHA, reverse passive hemagglutination; RIA, radioimmunoassay; NS, not specified or not available.
[a] Median scores are weighted by the study quality scores.
[b] Other includes the following: counting immunoassay (CIA), counterimmunoelectrophoresis technique (CIEP), hemagglutination inhibition (HI), immunoenzymatic assay (IA), latex agglutination (LATEX), microparticle enzyme immunoassay (MEIA), particle agglutination (PA), passive hemagglutination (PHA).

lence coupled with increased quality and specificity of testing methods.[22] That may certainly be the case in regards to the findings of this study.

Our estimates of HBsAg seroprevalence fall within the ranges provided by a 2006 US Centers for Disease Control and Prevention (CDC) publication.[23] Median seroprevalence estimates found in this study for HBeAg match those of previous studies.[24] Previous studies have neglected to analyze seroprevalence estimates by population type or by the method employed for seromarker testing. This study demonstrates that hepatitis B endemicity varies significantly by WHO sub-region and population type. A relatively high proportion of studies that neglected to state the method employed for seromarker testing prevented us from accurately determining if seroprevalence estimates varied according to testing method. Future research that is able to answer this question would contribute to the literature. This population-based review provides a comprehensive assessment of the burden of HBV throughout the world.

4.1. Limitations

This review is limited by the quality of the studies reviewed. On the basis of our criteria for establishing study quality (e.g., sample representation of the source population, sample size, potential biases), only 38% were identified as 5, on a scale from 1 (poor) to 5 (good). For one WHO region, only 29% of studies were considered good and in three WHO regions, only 37–40% of studies were considered good. To avoid providing poor studies equal representation to good studies in seroprevalence estimates, these estimates were weighted by the study's quality score. There was no way, other than inter-rater reliability and comparing our final estimates with the literature, to assess the validity of our quality assessment of the studies that we reviewed. Our strategy for weighting estimates according to quality score is not perfect, and it is likely that weighting median seroprevalence estimates by quality score does not eliminate all the deviations from the true seroprevalence values that are caused by many of the poorly developed study designs employed in the lower-quality papers that we reviewed.

Seroprevalence markers were influenced by the timing of hepatitis B vaccination. Over the study period, vaccination interventions became widely adopted in many WHO regions. Unfortunately, the high number of studies with no information about vaccination limited our ability to evaluate the effect of vaccination on seroprevalence scores. It would be useful if papers routinely included the timing of vaccination intervention relative to their study.

Most studies identified the testing method used for estimating seroprevalence. However, there remained 9–12% of studies, depending on the seroprevalence marker, that did not specify the testing method used. For certain WHO regions, the percentage was as high as 67%. Again, routine inclusion of such information in papers assessing HBV seroprevalence would be useful.

Lastly, while we meant to be as exhaustive as possible in our review methodology, it is possible that we missed studies that have been published on hepatitis B seroprevalence over the last 20 years.

5. Conclusions

This study is a comprehensive review of the literature comprising studies that measured the seroprevalence of three markers of hepatitis B infection (HBsAg, HBeAg, anti-HBc). While there has not been a significant trend in median worldwide seroprevalence over the last 20 years, the study found significant differences in seroprevalence between WHO regions, study populations, and seromarker testing methods. The results presented in this study will enable health professionals to track worldwide reported seroprevalence of hepatitis B markers during the period from 1990 to 2009.

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Conflict of interest: No conflict of interest to declare.

Appendix A. Member States by WHO region and mortality stratum

Region and mortality stratum	Description	Broad grouping	Member States
Africa (AFR)			
AFR-D	Africa with high child and high adult mortality	High-mortality developing	Algeria, Angola, Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Comoros, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mauritania, Mauritius, Niger, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Togo
AFR-E	Africa with high child and very high adult mortality	High-mortality developing	Botswana, Burundi, Central African Republic, Congo, Cote d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia, Zimbabwe
Americas (AMR)			
AMR-A	Americas with very low child and very low adult mortality	Developed	Canada, Cuba, United States of America
AMR-B	Americas with low child and low adult mortality	Low-mortality developing	Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, El Salvador, Grenada, Guadeloupe,[‡] Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, Puerto Rico,[‡] Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela (Bolivarian Republic of)
AMR-D	Americas with high child and high adult mortality	High-mortality developing	Bolivia, Ecuador, Guatemala, Haiti, Nicaragua, Peru

Appendix A (*Continued*)

Region and mortality stratum	Description	Broad grouping	Member States
South-East Asia (SEAR)			
SEAR-B	South-East Asia with low child and low adult mortality	Low-mortality developing	Indonesia, Sri Lanka, Thailand
SEAR-D	South-East Asia with high child and high adult mortality	High-mortality developing	Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Maldives, Myanmar, Nepal, Timor-Leste
EURope (EUR)			
EUR-A	Europe with very low child and very low adult mortality	Developed	Andorra, Austria, Belgium. Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland, United Kingdom
EUR-B	Europe with low child and low adult mortality	Developed	Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Georgia, Greenland,[‡] Kyrgyzstan, Poland, Romania, Slovakia, Tajikistan, The former Yugoslav Republic of Macedonia, Serbia and Montenegro, Turkey, Turkmenistan, Uzbekistan
EUR-C	Europe with low child and high adult mortality	Developed	Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Republic of Moldova, Russian Federation, Ukraine
Eastern Mediterranean (EMR)			
EMR-B	Eastern Mediterranean with low child and high adult mortality	Low-mortality developing	Bahrain, Iran (Islamic Republic of), Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates, West Bank and Gaza Strip[‡]
EMR-D	Eastern Mediterranean with high child and high adult mortality	High-mortality developing	Afghanistan, Djibouti, Egypt,[*] Iraq, Morocco, Pakistan, Somalia, Sudan, Yemen
Western Pacific (WPR)			
WPR-A	Western Pacific with very low child and very low adult mortality	Developed	Australia, Brunei Darussalam, Japan, New Zealand, Singapore
WPR-B	Western Pacific with low child and low adult mortality	Low-mortality developing	Cambodia,[†] China, Cook Islands, Fiji, French Ploynesia,[‡] Kiribati, Lao People's Democratic Republic,[†] Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Nauru, Niue, Palau, Papua New Guinea,[†] Philippines, Republic of Korea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Viet Nam

[*] Following improvements in child mortality over recent years, Egypt meets criteria for inclusion in subregion EMRO-B with low child mortality and low adult mortality. Egypt has been included in EMR-D for presentation of subregional totals for mortality and burden to ensure comparability with previous editions of *The World Health Report* and other WHO publications.

[†] Although Cambodia, the Lao People's Democratic Republic, and Papua New Guinea meet criteria for high child mortality, they have been included in the WPRO-B subregion with other developing countries of the Western Pacific Region for reporting purposes.

[‡] These countries are not member states of the World Health Organization.

Appendix B. Summary information from studies on HBV prevalence estimates according to WHO region

	Country	Source	Source Year	Population studied	Study design[a]	Sample size	Study quality	Age range	HBsAg prevalence (%)	Testing Method Used	HBeAg prevalence[b] (%)	Testing Method Used	Anti-HBc prevalence[c] (%)	Testing Method Used	Vaccination Intervention[d]
WHO AFR-D Region															
1	Algeria[e]	Ayed	1995	Blood donors	xxs	1112	Reasonable	18-61	3.6	ELISA			13.0	ELISA	Recommend
1	Algeria[e]	Ayed	1995	Pregnant women	xxs	515	Reasonable	18-40	1.6	ELISA			11.1	ELISA	Recommend
2	Burkina Faso[e]	Dao	2001	Pregnant women	xxs	917	Good	15-45	10.7	ELISA	18.2	ELISA			Recommend
3	Cameroon[e]	Zekeng	1990	Blood donors	xxs	5980	Good	18-45	11.72	ELISA	16.26	ELISA			Recommend
4	Cameroon	Chiaramonte	1991	Primary school - urban	xxs	702	Good	4-14	4.1	ELISA					Recommend
5	Cameroon	Rapicetta	1991	Primary school	xxs	702	Good	4-14	23.2	ELISA					n/c
6	Cameroon	Ndumbe	1992	Pregnant women	xxs	150	Good	Unknown	25.3	EIA	5.2	EIA			Recommend
7	Cameroon	Ndumbe	1993	Baka Pygmies	xxs	141	Good	18-45	14.2	EIA	10	EIA	93.6	EIA	Recommend
8	Cameroon	Ndumbe	1994	Pregnant women - rural	xxs	369	Good	10-49	5.4	ELISA			84.6	ELISA	n/c
9	Cameroon	Kowo	1995	Pygmy and Bantu	xxs	166	Good	12-80	7.2	MEIA					n/c
10	Equatorial Guinea	Basaras	1999	Mostly rural pops	xxs	2042	Reasonable	1-97	8.8	ELISA					Recommend
11	Gabon	Richard-Lenoble	1995	General pop	xxs	303	Reasonable	2-80	19	EIA			78	EIA	n/c
12	Gabon	Bertherat	1998	General pop	xxs	442	Good	14-55	13.8	EIA					n/c
13	Gabon	Bertherat	1999	General urban pop	xxs	442	Reasonable	Unknown	13.6	EIA					n/c
13	Gabon	Bertherat	1999	General rural pop	xxs	211	Reasonable	Unknown	19.4	EIA					n/c
14	Gabon	Makuwa	2008	Pregnant women	xxs	1186	Poor-Reason	14-40	9.2	EIA	10.1	EIA			n/c
15	Gabon	Makuwa	2009	General urban pop	xxs	394	Poor-Reason	14-60	12.9	EIA					n/c
15	Gabon	Makuwa	2009	General rural pop	xxs	961	Poor-Reason	15-60+	7.6	EIA					n/c
16	Gambia	Whittle	1990	Children from Manduar	xxs	115	Good	.5-4	38.2	RPHA	32.2	RIA			Post
16	Gambia	Whittle	1990	Children from Manduar	xxs	105	Good	5-9	32.4	RPHA	22.9	RIA			Post
16	Gambia	Whittle	1990	Children from Manduar	xxs	56	Good	10-14	35.3	RPHA	19.6	RIA			Post
16	Gambia	Whittle	1990	Children from Manduar	xxs	30	Good	15-19	33.3	RPHA	16.7	RIA			Post
16	Gambia	Whittle	1990	Children from Keneba	xxs	213	Good	.5-4	10.3	RPHA	8.9	RIA			Post
16	Gambia	Whittle	1990	Children from Keneba	xxs	206	Good	5-9	15.5	RPHA	7.6	RIA			Post
16	Gambia	Whittle	1990	Children from Keneba	xxs	136	Good	10-14	14.0	RPHA	5.1	RIA			Post
16	Gambia	Whittle	1990	Children from Keneba	xxs	47	Good	15-19	17.0	RPHA	2.1	RIA			Post
17	Gambia	Fortuin	1993	Unvaccinated children	xxs	816	Good	3-4	13	RPHA			29	RIA	Post
17	Gambia	Fortuin	1993	Vaccinated children	xxs	720	Good	3-4	1	RPHA			5	RIA	Post
18	Ghana	Acquaye	1994	Pregnant women	xxs	692	Good	13-51	6.4	LATEX					Recommend
19	Ghana	Adu-Sarkodie	1996	Blood donors	xxs	731	Good	Unknown	19.5	EIA					Recommend
19	Ghana	Adu-Sarkodie	1996	Pregnant women	xxs	1020	Good	Unknown	14	EIA					Recommend
20	Ghana	Martinson	1996	School children - rural	xxs	803	Good	6-18	15.8	RIA			54.8	RIA	Prior
21	Ghana	Martinson	1998	General pop	xxs	1385	Good	1-45+	20.9	RIA			69.2	RIA	Recommend
22	Ghana	Adjei	2006	Prison inmates	xxs	281	Poor	17-84	17.4	ELISA					Recommend
22	Ghana	Adjei	2006	Prison officers	xxs	82	Poor	17-84	3.7	ELISA					Recommend
23	Guinea[e]	Ivanov	1990	General pop	Xxs	1119	Good	1-85	16.6	EIA					n/c
24	Madagascar	Boisier	1996	General pop	xxs	921	Good	1-94	20.5	ELISA	33	ELISA	38.2	ELISA	Prior
25	Madagascar[e]	Migliani	2000	General pop	xxs	654	Reasonable	2-93	14.2	ELISA			42.7	ELISA	Recommend
26	Mali[e]	Maiga	1990	Adult women	xxs	641	Good	14-47	41.7	IA	6.0	IA	91.0	IA	Recommend
27	Mauritania[e]	Rui	1998	School children	xxs	267	Reasonable	6-22	16.8	ELISA	28.9	ELISA	50.2	ELISA	Recommend
28	Mauritania[e]	Lo Baidy	1999	Blood donors	xxs	349	Reasonable	Unknown	20.3	ELISA					Recommend
29	Nigeria	Amazigo	1990	Urban dwellers	xxs	341	Reasonable	17-48	5.6	RIA			6.7	RIA	n/c
29	Nigeria	Amazigo	1990	Rural dwellers	xxs	351	Reasonable	5-56	8.8	RIA			12.3	RIA	n/c
30	Nigeria	Obi	1993	Pregnant women	xxs	250	Reasonable	Unknown	4.4	NS					n/c
31	Nigeria	Olubuyide	1993	Urban dwellers	xxs	89	Poor-Reason	0-52	47	ELISA					Recommend
31	Nigeria	Olubuyide	1993	Rural dwellers	xxs	100	Poor-Reason	0-52	49	ELISA					Recommend
32	Nigeria	Harry	1994	Male blood donors	xxs	287	Good	18-55	22	ELISA	30.2	ELISA	86.8	ELISA	Recommend
32	Nigeria	Harry	1994	Pregnant women	xxs	224	Good	14-40	11.6	ELISA	12.0	ELISA	64.3	ELISA	Recommend
33	Nigeria	Mutimer	1994	Local control patients	xxs	219	Poor-Reason	1-56	5.9	EIA			35.2	EIA	Recommend
33	Nigeria	Mutimer	1994	Commercial blood donors	xxs	104	Poor-Reason	Unknown	8.7	EIA			48.1	EIA	Recommend
34	Nigeria	Bada	1996	Pregnant women	xxs	100	Poor-Reason	15-41	16	ELISA					Recommend
34	Nigeria	Bada	1996	Patients	xxs	100	Poor-Reason	15-60	36	ELISA					Recommend

Appendix B (*Continued*)

	Country	Source	Source Year	Population studied	Study design[a]	Sample size	Study quality	Age range	HBsAg prevalence (%)	Testing Method Used	HBeAg prevalence[b] (%)	Testing Method Used	Anti-HBc prevalence[c] (%)	Testing Method Used	Vaccination Intervention[d]
34	Nigeria	Bada	1996	Blood donors	xxs	295	Poor-Reason	15-54	21.7	ELISA					Recommend
35	Nigeria	Akenami	1997	Malnourished children	xxs	206	Reasonable	1-3	26	ELISA					n/c
35	Nigeria	Akenami	1997	Healthy children	xxs	200	Reasonable	1-3	20	ELISA					n/c
36	Nigeria	Chikwem	1997	Blood donors	xxs	364	Reasonable	20+	14.8	ELISA					n/c
37	Nigeria	Halim	1998	Blood donors-males	xxs	200	Reasonable	20-54	26	ELISA					Recommend
38	Nigeria	Aganga-Williams	1999	Women	xxs	501	Reasonable	18-35	8.9	ELISA					Prior
39	Nigeria	Salako	2002	Chronic renal failure patients	xxs	45	Poor	17-62	13.3	ELISA					Recommend
39	Nigeria	Salako	2002	Matched controls	xxs	45	Poor	18-66	11	ELISA					Recommend
40	Nigeria	Oronsaye	2004	Blood donors	xxs	5737	Good	Unknown	11.0	LATEX					n/c
41	Nigeria	Akani	2005	Pregnant women	xxs	600	Reas-Good	Unknown	4.3	ELISA					Recommend
42	Nigeria	Odusanya	2005	Vaccinated children	ccs	223	Reasonable	1-4	1.3	IA					Post
42	Nigeria	Odusanya	2005	Unvaccinated children	ccs	219	Reasonable	1-4	4.6	IA					Post
43	Nigeria	Uneke	2005	Blood donors	xxs	175	Poor-Reason	20-40	14.3	ELISA					n/c
43	Nigeria	Uneke	2005	HIV patients	xxs	490	Poor-Reason	17-60	25.9	ELISA					n/c
44	Nigeria	Ikeme	2006	Pregnant women	xxs	7581	Poor-Reason	Unknown	0.84	ELISA					n/c
45	Nigeria	Lesi	2007	HIV/AIDS patients	xxs	120	Reasonable	Unknown	9.2	IA	27.3	IA			n/c
46	Nigeria	Forbi	2008	Female sex workers	xxs	720	Poor-Reason	16-36+	17.1	ELISA					n/c
47	Nigeria	Okpalugo	2008	Preoperative patients	xxs	100	Poor	Unknown	18.0	Unknown					n/c
48	Nigeria	Ola	2008	Butchers	xxs	180	Reasonable	Unknown	9.4	ELISA					Recommend
48	Nigeria	Ola	2008	Traders	xxs	180	Reasonable	Unknown	3.3	ELISA					Recommend
49	Nigeria	Otegbayo	2008	HIV-infected patients	xxs	1779	Reasonable	15-65+	11.9	ELISA					n/c
50	Reunion Island[e]	Michault	2000	Pregnant women	xxs	1416	Reasonable	14-45					6.35	EIA	n/c
51	Senegal	Roingeard	1993	Pregnant women	xxs	284	Reasonable	Unknown	13.7	ELISA	10.2	ELISA	80	ELISA	Concurrent
51	Senegal	Roingeard	1993	Newborns	xxs	156	Reasonable	Unknown	7	ELISA					Concurrent
52	Senegal	Coursaget	1994	Immunized children (<3 doses)	cos	63	Reasonable	9-12	12.7	RIA			41.3	RIA	Post
52	Senegal	Coursaget	1994	Immunized children (3+ doses)	cos	41	Reasonable	9-12	2.4	RIA			26.8	RIA	Post
52	Senegal	Coursaget	1994	Immunized children (w/booster)	cos	51	Reasonable	9-12	2.0	RIA			13.7	RIA	Post
52	Senegal	Coursaget	1994	Unimmunized children	cos	48	Reasonable	9-12	18.7	RIA			72.9	RIA	Post
53	Senegal	Diop-Ndiaye	2008	HIV-1 patients	xxs	363	Reasonable	16-66	16.8	ELISA			83.2	ELISA	Recommend
54	Seychelles	Bovet	1999	General adult pop	xxs	1006	Good	25-64					8	ELISA	Concurrent
55	Sierra Leone	Hodges	1998	Primary school children	xxs	66	Reasonable	6-12	18	ELISA			71	ELISA	Recommend
WHO AFR-E Region															
1	Burundi	de Lalla	1990	Blood donors and patients	xxs	90	Poor-Reason	15-61	15.6	RIA					n/c
2	Central African Rep.	Pawlotsky	1995	Patients	xxs	157	Good	15-58	14	EIA	4.5	EIA	89	EIA	n/c
3	Congo[e]	Itoua-Ngaporo	1995	Pregnant women	xxs	292	Good	15-45	6.5	RIA	2.05	RIA	51.3	RIA	Recommend
4	Dem. Rep of Congo	Jager	1990	Blood donors	xxs	2237	Good	Unknown	13.1	NS			70.9	NS	n/c
5	Ethiopia	Tsega	1995	Blood donors	xxs	459	Reas-Good	Unknown	11	RIA					n/c
6	Ethiopia	Rahlenbeck	1997	Blood donors - male	xxs	549	Reas-Good	Unknown	14.4	LATEX					n/c
7	Ethiopia	Shimelis	2008	HIV VCT and ART patients	xxs	620	Reas-Good	<20-50+	5.7	ELISA			44.8	ELISA	n/c
8	Ivory Coast[e]	Lohoues	1998	Pregnant women	xxs	395	Reasonable	Unknown	18.2	ELISA	15.3	ELISA			Prior
8	Ivory Coast[e]	Lohoues	1998	Newborns of HBsAg+ mothers	xxs	61	Reasonable	Unknown	32.8	ELISA					Prior
9	Ivory Coast	Rouet	2004	HIV positive pregnant women	xxs	499	Good	Unknown	9.0	EIA					Recommend
9	Ivory Coast	Rouet	2004	HIV negative pregnant women	xxs	498	Good	Unknown	8.0	EIA					Recommend
10	Ivory Coast[c]	Kra	2007	Blood donors	xxs	1231	Good	18-65	12.5	ELISA					n/c

11	Ivory Coast	Rouet	2008	Children infected w/HIV1	xxs	280	Reasonable	Unknown	12.1	EIA	82.4	EIA			Recommend
12	Kenya	Okoth	1991	Outpatients	xxs	6748	Reasonable	1-71	3	RPHA					Recommend
12	Kenya	Okoth	1991	Primary school children	xxs	2296	Reasonable	Unknown	1.4	RPHA					Recommend
13	Kenya[e]	Yamanaka	1991	Pop of Maragua	xxs	8210	Reasonable	Unknown	3.9	ELISA					Recommend
14	Kenya	Mwangi	1999	Blood donors	xxs	1703	Good	18-60	2.8	RPHA			39.2	EIA	n/c
15	Malawi	Ahmed	1998	Pregnant women - rural	xxs	150	Reasonable	Unknown	13	ELISA	17	ELISA	71.7	ELISA	n/c
16	Malawi	Nyirenda	2008	Hospital patients	xxs	226	Good	14-80	17.5	IA					Recommend
17	Nambia	Joubert	1991	Male pop	xxs	475	Reasonable	0-75					12.2	RIA	n/c
18	Nambia	Joubert	1991	Female pop	xxs	420	Reasonable	0-75					10.9	RIA	n/c
19	Namibia	Aspinall	1994	Children	xxs	248	Poor-Reason	5-19	2.4	RIA			2.8	RIA	Prior
20	Namibia	Steele	1995	Bushmen adults & child	xxs	106	Poor-Reason	Unknown	5.7	MEIA			19	MEIA	Recommend
21	South Africa	Klugman	1991	Pregnant women	xxs	42	Poor	Unknown	9.5	EIA			31	EIA	n/c
22	South Africa	Gaobepe	1995	Bushmen	xxs	400	Good	1-87	6.8	EIA			49.6	EIA	Prior
23	South Africa	Vardas	1999	Children	xxs	2288	Good	0-6	10.4	EIA					Prior
24	South Africa	Mphahlele	2006	HIV positive patients	ccs	167	Reasonable	15-78	16.2	MEIA			85.0	IA	n/c
24	South Africa	Mphahlele	2006	HIV negative patients	ccs	128	Reasonable	15-78	35.2	MEIA			82.0	IA	n/c
25	South Africa	Firnhaber	2008	HIV patients	xxs	502	Reasonable	Unknown	4.8	MEIA			42.6	MEIA	Recommend
26	Tanzania	Jacobs	1994	Voluntary blood donors	xxs	525	Good	15-24	10.1	ELISA					n/c
26	Tanzania	Jacobs	1994	Relative blood donors	xxs	529	Good	15-24	13	ELISA					n/c
26	Tanzania	Jacobs	1994	Relative blood donors	xxs	1291	Good	25+	11.1	ELISA					n/c
27	Tanzania	Pellizer	1994	General pop	xxs	1004	Reasonable	1-76	4.4	ELISA	10	ELISA			Prior
28	Tanzania	Jacobs	1997	Voluntary blood donors	xxs	253	Good	15-24	9.9	ELISA					Recommend
28	Tanzania	Jacobs	1997	Relative blood donors	xxs	952	Good	15-25+	11.2	ELISA					Recommend
29	Tanzania	Miller	1998	Healthy adults	xxs	403	Good	Unknown	6	ELISA			60	ELISA	Recommend
30	Tanzania	Matee	1999	Blood donors	xxs	100	Good	18-60	11	RPHA					n/c
31	Tanzania	Menendez	1999	Pregnant women	xxs	980	Good	15-50	6.3	ELISA	19.3	ELISA	56.2	ELISA	Recommend
32	Tanzania	Stark	2000	Females - Rural	xxs	799	Good	15-45	17	NS			74	NS	Recommend
1	Uganda	de Lalla	1990	General adult pop	xxs	358	Poor-Reason	14-60	10	RIA					n/c
33	Zambia	Oshitani	1995	Pregnant women	xxs	2098	Poor-Reason	Unknown	6.5	ELISA	16.1	ELISA			Prior
34	Zambia	Oshitani	1996	Pregnant women	xxs	1861	Good	11-48	5.7	ELISA	12.3	RPHA			n/c
35	Zimbabwe	Tswana	1996	General pop	xxs	3394	Good	10-61	15.4	ELISA	25	ELISA			Recommend
36	Zimbabwe	Madzime	1999	Pregnant women	xxs	984	Good	Unknown	25	EIA	3.3	EIA			Recommend
WHO AMR-A Region															
1	Canada	Louie	1992	Hospital patients	xxs	3000	Poor	14-99	2.1	EIA					n/c
2	Canada	Sweet	1993	Pregnant women	xxs	5754	Reas-Good	Unknown	.1	EIA					n/c
3	Canada	Glasgow	1997	Young adults	xxs	661	Poor-Reason	14-30	0.36	EIA					Concurrent
4	Canada	Roy	1999	Street adolescents	xxs	434	Reasonable	14-25	1.6	EIA					Recommend
5	USA (Philadelphia)	Silverman	1991	Pregnant women- Group I	xxs	1555	Reasonable	Unknown	.8	EIA					Prior
5	USA (Philadelphia)	Silverman	1991	Pregnant women- Group II	xxs	208	Reasonable	Unknown	6.7	EIA					Prior
6	USA	Hyams	1992	Military recruit pop	xxs	1538	Reasonable	17-35	.3	EIA			2.3	EIA	n/c
7	USA (California)	Rhee	1992	Patients	xxs	2209	Reasonable	12+	2.6	NS					n/c
8	USA (Alaska)	McMahon	1993	Alaska Natives	xxs	52022	Good	0-60+	3.1	EIA	35.4	EIA	8.7	EIA	Post
9	USA	Morris	1993	Pregnant women	xxs	716	Reas-Good	Unknown	.3	NS					n/c
10	USA (Hawaii)	Pon	1993	Children	xxs	4936	Reasonable	6-17	1.7	RIA					Prior
11	USA (Maryland)	Caplan	1995	Patients	xxs	984	Reasonable	Unknown					20	ELISA	n/c
12	USA (New York)	Montecalvo	1995	Patients	xxs	1058	Poor-Reason	1-96	1.4	ELISA			12.8	ELISA	Recommend
13	USA (San Francisco)	Siegal	1995	General unmarried adults	xxs	1108	Reasonable	20-44					14	RIA	Recommend
14	USA (Chicago)	Sloan	1995	Patients	xxs	994	Reas-Good	Unknown	3.1	ELISA			19.8	ELISA	n/c
15	USA	Kaur	1996	General adults	xxs	8650	Reasonable	Unknown	2.1	EIA			17.8	EIA	Recommend
16	USA (St. Louis)	Chien	1999	Nursing home residents	xxs	199	Poor	60+	0	EIA			24.1	EIA	Prior
17	USA	McQuillan	1999	General pop	xxs	19502	Good	6-74	.4	ELISA					n/c
18	USA (North Carolina)	Pierce	1999	Females	xxs	4356	Good	Unknown	.2	NS					Post
19	USA (Alaska)	Harpaz	2000	Alaska Natives	xxs	603	Reas-Good	0-30	9	RIA & EIA	19	EIA	16	RIA	Post
20	USA (San Francisco)	Henandez	2000	Females	xxs	1337	Reas-Good	18-29	.75	EIA			8.9	EIA	n/c
21	USA	Patel	2002	Vietnamese Immigrants	xxs	743	Reas-Good	Unknown	13.9	NS	41.7	NS			Recommend
22	USA	Euler	2003	Pregnant women (Asian)	xxs	2000	Good	Unknown	5.79	NS					Recommend
22	USA	Euler	2003	Pregnant women (White)	xxs	1910	Good	Unknown	.60	NS					Recommend
22	USA	Euler	2003	Pregnant women (Black)	xxs	1855	Good	Unknown	.97	NS					Recommend
22	USA	Euler	2003	Pregnant women (Hispanic)	xxs	1732	Good	Unknown	.14	NS					Recommend

Appendix B (*Continued*)

	Country	Source	Source Year	Population studied	Study design[a]	Sample size	Study quality	Age range	HBsAg prevalence (%)	Testing Method Used	HBeAg prevalence[b] (%)	Testing Method Used	Anti-HBc prevalence[c] (%)	Testing Method Used	Vaccination Intervention[d]
23	USA (Baltimore)	Torbenson	2004	Injection drug users	xxs	188	Poor-Reason	17+	.04	IA					n/c
24	USA	Zou	2004	Tissue donors	xxs	10901	Good	Unknown	.23	NS					n/c
25	USA (Seattle)	Burt	2007	IV drug users	xxs	1445	Reasonable	18-30					27	NS	Recommend
26	USA (Alaska)	Hammitt	2007	Vaccinated children	Cos	37	Poor	13-15					0.0	ELISA	Recommend
27	USA (San Francisco)	Lin	2007	Asian American pop	xxs	3163	Poor-Reason	18-101	8.9	NS					Recommend
28	USA (New York)	Toussi	2007	HIV positive children	xxs	242	Reasonable-Good	0-23	.02	NS	83.5	NS			Recommend
29	USA	Tsui	2007	HIV positive women	xxs	3700	Poor-Reason	Unknown					13.2	EIA	n/c
30	USA	Amesty	2008	Drug users	xxs	1211	Poor-Reasonable	15-40	26.8	ELISA					Recommend
31	USA (Grand Rapids)	Hall	2008	Emergency department patients	xxs	403	Reasonable	15-49	.74	ELISA					n/c
32	USA	Hennessey	2009	White jail inmates	xxs	1292	Good	15-40+	.9	EIA			19	EIA	Recommend
33	USA (Northern California)	Levy	2009	Immigrants	xxs	1512	Reasonable	18-35					4.1	PCR	Recommend
WHO AMR-B Region															
1	Argentina	Silveira	1999	General pop	xxs	1454	Reasonable	1-40	.2	EIA			2.1	ELISA	Recommend
2	Argentina	Bautista	2009	Non-immigrant female sex workers	xxs	456	Poor-Reasonable	Unknown					12.6	ELISA	n/c
2	Argentina	Bautista	2009	Immigrant female sex workers	xxs	169	Poor-Reasonable	Unknown					19.4	ELISA	n/c
3	Belize	Craig	1993	Military personnel	xxs	492	Reasonable	18-44	4	ELISA			33	ELISA	Recommend
4	Belize	Chamberlin	1996	School students	xxs	587	Reas-Good	4-22	7.7	EIA			43.3	EIA	Prior
5	Belize	Scott-Wright	1997	Pregnant women	xxs	543	Good	14+	.2	ELISA			14.9	ELISA	Recommend
6	Brazil[e]	Passos	1992	General pop	xxs	1951	Reas-Good	1-65	.1	IA			7.69	IA	n/c
7	Brazil[e]	Sabino	1992	Pregnant women	xxs	477	Poor-Reason	14-46	.4	IA			9.2	IA	n/c
8	Brazil[e]	Goncales Jr.	1993	Blood donors	xxs	29833	Good	Unknown	1.52	ELISA			11	ELISA	n/c
9	Brazil	Porto	1994	Street adolescents	xxs	496	Reasonable	9-20	2	EIA			13.5	EIA	Recommend
10	Brazil (Amazon)[e]	Soares	1994	Pop of Paranatinga	xxs	222	Reas-Good	Unknown	14.4	EIA					Recommend
10	Brazil (Amazon)[e]	Soares	1994	Pop of Maroxewara	xxs	128	Reas-Good	Unknown	0	EIA					Recommend
11	Brazil	Vasconcelos	1994	Blood donors	xxs	5000	Good	18-65	.8	EIA			13.9	EIA	n/c
12	Brazil[e]	Uip	1995	Blood donors	xxs	2521	Reas-Good	18-60	.67	ELISA			6.66	ELISA	n/c
13	Brazil [e]	Azevedo	1996	Indigenous children	xxs	222	Poor-Reason	0-14	4.5	IA			44.1	IA	Prior
13	Brazil[e]	Azevedo	1996	Women of fertile age	xxs	33	Poor-Reason	Unknown	12	IA					Prior
14	Brazil[e]	Cardoso	1996	Pregnant women	xxs	1459	Reasonable	12-49	.5	ELISA					Recommend
15	Brazil[e]	Duarte	1996	Pregnant women	xxs	7992	Good	Unknown	.95	ELISA	21.3	EIA			Recommend
16	Brazil	Souto	1997	General pop	xxs	735	Reas-Good	10-90	1.2	EIA					Recommend
17	Brazil[e]	Clemens	2000	General pop	xxs	3653	Good	1-40					7.9	ELISA	Recommend
18	Brazil[e]	Miranda	2000	Patients	xxs	632	Reasonable	Unknown	.3	ELISA			13.9	ELISA	n/c
19	Brazil[e]	Reiche	2000	Pregnant women	xxs	1502	Reasonable	12-58	.8	ELISA					Recommend
20	Brazil	Treitinger	2000	Blood donors	xxs	2583	Reasonable	Unknown	.1	EIA			8.6	EIA	n/c
21	Brazil	Aguiar	2001	Blood donors	xxs	552	Reasonable	19-54	.7	EIA			9.4	EIA	n/c
22	Brazil	Rosini	2003	Blood donors	xxs	263795	Good	Unknown	.64	IA			5.35	IA	Recommend
23	Brazil	Souza	2003	Hemodialysis patients	xxs	100	Reasonable	13-82	4	ELISA			39	ELISA	n/c
24	Brazil	Ono-Nita	2004	Asian participants	xxs	305	Good	Unknown	28.4	EIA			59.3	EIA	Recommend
24	Brazil	Ono-Nita	2004	Western participants	xxs	209	Good	Unknown	9.9	EIA			26.8	EIA	Recommend
25	Brazil[c]	Souza	2004	HIV patients	xxs	401	Reasonable	18-65+	8.5	ELISA			39.7	ELISA	n/c
26	Brazil	Ciorlia	2005	Healthcare workers	xxs	1433	Good	Unknown	0.8	ELISA					Recommend
26	Brazil	Ciorlia	2005	Healthcare admin personnel	xxs	872	Good	Unknown	0.2	ELISA					Recommend
26	Brazil	Ciorlia	2005	Blood donor candidates	xxs	2583	Good	Unknown	0.2	ELISA					Recommend
27	Brazil[c]	Valente	2005	Blood donors	xxs	25891	Good	Unknown	0.6	ELISA					n/c
28	Brazil	Andrade	2006	Blood donors	xxs	128497	Good	Unknown	.27	MEIA			3.68	MEIA	Recommend
29	Brazil	Batista	2006	Dentists	xxs	474	Good	21-69	0.6	ELISA			1.1	ELISA	Recommend
30	Brazil	Bellissimo-Rodrigues	2006	Dentists	xxs	135	Reasonable	22-56	0.7	ELISA			8.1	ELISA	Post
31	Brazil	Bertolini	2006	Pregnant women	xxs	3188	Poor-Reason	12-44	1.5	ELISA			18.5	ELISA	Recommend

32	Brazil	Ferreria	2006	Hemodialysis patients	xxs	1095	Good	3-97	2.4	ELISA			27.3	ELISA	n/c
33	Brazil	Oliveria	2006	Secondary school students	xxs	664	Good	Unknown	0.1	MEIA			1.7	MEIA	Recommend
34	Brazil	Sucupira	2006	HIV patients	xxs	44	Poor	Unknown	27	ELISA					n/c
35	Brazil[c]	Tovo	2006	HIV patients	xxs	343	Reasonable	Unknown	4.6	IA			38.5	IA	n/c
36	Brazil[c]	Nunes	2007	Parakana indians	xxs	258	Reasonable	Unknown	3.9	EIA	20.0	EIA	53.5	EIA	Concurrent
37	Brazil	Zago	2007	HIV positive patients	xxs	851	Reasonable	Unknown	3.8	ELISA					n/c
38	Brazil[c]	Aquino	2008	Pop of Para	xxs	11282	Good	Unknown	3.6	EIA			37.7	MELISA	Recommend
39	Brazil[c]	Figueiredo	2008	Young women	xxs	1029	Good	20-26	0.9	EIA			4.2	EIA	n/c
40	Brazil	Kupski	2008	Blood donors	xxs	244	Reasonable	Unknown					85.7	EIA	n/c
41	Brazil	Matos	2008	Long distance truck drivers	xxs	641	Good	Unknown	2.5	ELISA			18.3	ELISA	Recommend
42	Brazil	Miranda	2008	Young women	xxs	1029	Reasonable-good	18-29	0.9	EIA			4.2	EIA	Recommend
43	Brazil	Motta-Castro	2008	Afro-Brazilian pop	xxs	239	Good	2-87	8.4	ELISA					n/c
44	Brazil	Nascimento	2008	First-time blood donors	xxs	3598	Good	18-62	0.33	ELISA			4.6	ELISA	n/c
45	Brazil	Tolentino	2008	Inflammatory bowel disease patients	xxs	176	Reasonable	18-84	2.3	ELISA			17	ELISA	Recommend
46	Brazil	de Lima	2009	Pregnant women (low-income)	xxs	202	Reasonable	12-41	1.0	MEIA					n/c
46	Brazil	de Lima	2009	Post-partum women (low-income)	xxs	332	Reasonable	13-44	1.2	MEIA					n/c
47	Brazil	Ferreria	2009	Non-injecting drug users	xxs	852	Poor-Reason	18+	1.1	ELISA	22.2	ELISA	14	ELISA	Recommend
48	Brazil	Guimaraes	2009	Adults with mental illness	xxs	2238	Good	18+	1.6	ELISA			14.7	ELISA	n/c
49	Brazil, Amazon	Arboleda	1995	General pop	xxs	798	Good	0-86	1.6	ELISA			21.4	ELISA	n/c
50	Brazil, Amazon	Santos	1995	Amerindian pop	xxs	2222	Reasonable	1-80	3	EIA					n/c
50	Brazil, Amazon	Santos	1995	Urban pop	xxs	2022	Reasonable	9-60	.9	EIA					n/c
51	Brazil, Amazon	Coimbra	1996	Amerindian pop	xxs	449	Reasonable	0-50+	2.0	NS			73.7	NS	n/c
52	Brazil, Amazon	Ferrari	1999	Amerindian pop	xxs	119	Reasonable	1-76	3.4	RIA			35.3	RIA	n/c
53	Brazil, Amazon[c]	Brasil	2003	Household contacts of HBV index cases	xxs	258	Reasonable	1-56	12.0	ELISA			51.6	ELISA	n/c
54	Brazil, Amazon[c]	Braga	2005	General pop	xxs	605	Good	Unknown	3.3	ELISA			49.9	ELISA	n/c
55	Brazil, Amazon	Viana	2005	General pop	xxs	2656	Reasonable	0-92	3.3	ELISA			61.5	ELISA	n/c
56	Brazil, Amazon	Braga	2006	HIV/AIDS patients	xxs	704	Good	0-50+	6.4	ELISA			40.2	ELISA	Recommend
57	Brazil, Amazon	Lobato	2006	Children of HBsAg positive women	xxs	48	Reasonable	0-16	10.4	ELISA			37.5	ELISA	n/c
57	Brazil, Amazon	Lobato	2006	Children of HBsAg negative women	xxs	105	Reasonable	0-16+	1.9	ELISA			6.8	ELISA	n/c
1	Chile	Silveira	1999	General pop	xxs	496	Reas-Good	1-40					.6	ELISA	Recommend
58	Colombia[e]	Velandia	1997	Women	xxs	246	Poor	15-50	4.1	ELISA			1.6	ELISA	n/c
59	Dominican Republic	Shichijo	1995	General pop (Group I)	xxs	408	Poor-Reason	0-61+	4.7	ELISA					Prior
59	Dominican Republic	Shichijo	1995	General pop (Group II)	xxs	2000	Poor-Reason	20-70+	3.2	RPHA					Prior
1	Dominican Republic	Silveira	1999	General pop	xxs	473	Reasonable	1-40	1.9	RIA			21.4	RIA	Recommend
60	Guadeloupe	Viel	1995	Blood donors	xxs	2339	Reas-Good	16-65	3.1	RIA			22.1	RIA	n/c
61	Mexico[e]	Alvarez-Munoz	1991	Relatives of HBsAg+ individuals	xxs	152	Poor	Unknown	3.9	EIA					Recommend
62	Mexico[e]	Oritz-Ibarra	1996	Pregnant women	xxs	1500	Reasonable	Unknown	.26	ELISA	0	ELISA	1.86	ELISA	n/c
63	Mexico	Alverez-Munoz	1997	Healthy pregnant women	xxs	5130	Reasonable	12-49	.02	ELISA			.87	ELISA	n/c
63	Mexico	Alverez-Munoz	1997	Pregnant women w/complications	xxs	1123	Reasonable	12-49	.09	ELISA			.36	ELISA	n/c
64	Mexico[e]	Ayala-Gaytan	1997	Blood donors	xxs	78566	Good	18-85	.16	IA			2	IA	n/c
65	Mexico[e]	Pita-Ramirez	1997	Blood donors	xxs	10077	Good	18-60	.33	EIA					n/c
66	Mexico[e]	Mendez-Sanchez	1999	Blood donors	xxs	9099	Reas-Good	Unknown	.11	ELISA					n/c
1	Mexico	Silveira	1999	General pop	xxs	5212	Good	1-40	.1	EIA			1.4	ELISA	Recommend
67	Mexico[c]	Alvarado-Esquivel	2006	Acute and chronic liver disease patients	xxs	65	Poor	Unknown	3.1	IA					n/c
68	Mexico	Mendez-Sanchez	2006	Nurses	xxs	379	Poor	Unknown					1.6	IA	Recommend

Appendix B (*Continued*)

	Country	Source	Source Year	Population studied	Study design[a]	Sample size	Study quality	Age range	HBsAg prevalence (%)	Testing Method Used	HBeAg prevalence[b] (%)	Testing Method Used	Anti-HBc prevalence[c] (%)	Testing Method Used	Vaccination Intervention[d]
69	Mexico	Calderon	2009	Transfusion patients	xxs	300	Good	5-75	7	EIA					n/c
70	Puerto Rico	Deseda	1995	Pregnant women	xxs	992	Reasonable	15-30+	.4	RIA			9.2	RIA	n/c
71	Venezuela[e]	Ponce	1994	Adults	xxs	146	Poor-Reason	20-90	2.1	EIA			28	EIA	n/c
72	Venezuela	Blitz-Dortman	1996	General Amerindian pop	xxs	293	Reasonable	Unknown	7.4	EIA			66.8	EIA	n/c
73	Venezuela[e]	Leon	1998	Blood donors	xxs	53338	Good	Unknown	.076	ELISA			5.28	NS	n/c
1	Venezuela	Silveira	1999	General pop	xxs	469	Reasonable	1-40					3.2	ELISA	Recommend
74	Venezuela[c]	Monsalve-Castillo	2008	Amerindian pop	xxs	149	Poor	5-65+	29.5	EIA	6.8	EIA	77.9	EIA	n/c
WHO AMR-D Region															
1	Bolivia	Konomi	1999	Blood donors	xxs	574	Reasonable	17-56	.3	PA					n/c
2	Bolivia[e]	Leon	1999	Amerindian pop	xxs	366	Reasonable	Unknown					74	EIA	Recommend
2	Bolivia[e]	Leon	1999	Rural pop	xxs	187	Reasonable	Unknown					11.2	EIA	Recommend
2	Bolivia[e]	Leon	1999	Urban pop	xxs	198	Reasonable	Unknown					11.6	EIA	Recommend
3	Nicaragua	Perez	1996	General pop	xxs	447	Reas-Good	2+	.9	EIA					n/c
4	Peru[e]	Vildosola	1990	General pop	xxs	680	Reasonable	Unknown	3.8	ELISA					Recommend
5	Peru[c]	Vildozola	2006	Pregnant adolescents	xxs	1048	Poor-Reason	14-19	0.67	ELISA			3.53	ELISA	n/c
WHO EMR-B Region															
1	Iran	Amini	1993	General pop	xxs	4930	Good	0-69+	2.5	ELISA	13.8	ELISA	5.1	ELISA	n/c
2	Iran	Jahani	2003	Large vehicle drivers	xxs	1113	Good	18-70	5.9	ELISA					Recommend
3	Iran	Alizadeh	2005	General pop	xxs	1824	Good	>5	2.3	ELISA			7.8	ELISA	Recommend
4	Iran	Alizadeh	2006	General pop	xxs	1824	Reasonable	6-93	2.3	ELISA			7.8	ELISA	Recommend
5	Iran	Vahdani	2006	Street children	xxs	102	Poor	<15	3.0	ELISA					n/c
6	Iran	Talaie	2007	Non-IV drug opioid poisoned patients	xxs	214	Good	16-87	1.86	EIA					n/c
7	Iran	Pourkarim	2008	Afghan refugees	xxs	74	Poor	28-60	60.8	NS	14.7	NS	85.1	NS	n/c
8	Iran	Amini Kafi-Abad	2009	Blood donors	xxs	6499851	Good	<29-50+	0.56	IA					Recommend
9	Iran	Merat	2009	General pop	xxs	6583	Good	18-65	2.6	ELISA			16.4	ELISA	Recommend
10	Iran	Ramezani	2009	HIV patients	xxs	29	Reasonable	Unknown	0	ELISA			17.2	ELISA	n/c
10	Iran	Ramezani	2009	HIV-HCV coinfected patients	xxs	63	Reasonable	Unknown	6.6	ELISA			28.6	ELISA	n/c
11	Jordan	Toukan	1990	General pop	xxs	1115	Good	0-60+	9.9	RIA	31.8	RIA			Prior
12	Jordan	Batayneh	2002	Pregnant women	xxs	1000	Reas-Good	15-44	4.3	ELISA	2.3	ELISA	11.1	ELISA	Recommend
13	Lebanon	Nabulsi	1997	Pregnant women	xxs	558	Reas-Good	16-44	2.9	ELISA	6.3	ELISA			Recommend
14	Lebanon	Nabulsi	2001	Children	xxs	841	Good	0-6	.12	ELISA					Recommend
15	Lebanon	Irani-Hakime	2006	Blood donors	xxs	16084	Good	Unknown	0.9	ELISA					n/c
16	Lebanon	Saab	2007	General pop	xxs	2634	Good	14-71	1.6	ELISA					Prior
17	Lebanon	Ramia	2008	HIV patients	xxs	101	Poor	25-60	6.9	IA			23.8	ELISA	n/c
18	Oman	Kaminski	2006	Blood donors	xxs	200	Poor-Reason	Unknown					20.5	EIA	n/c
19	Saudi Arabia	Bahakim	1991	Adults males	xxs	500	Good	18-55					28	EIA	n/c
19	Saudi Arabia	Bahakim	1991	Pregnant women	xxs	260	Good	16-40					28.5	EIA	n/c
20	Saudi Arabia	Al-Faleh	1992	Children	xxs	4575	Poor	1-10	6.7	ELISA			4.2	ELISA	Prior
21	Saudi Arabia	Abdelaal	1994	Male blood donors	xxs	744	Good	Unknown	6.2	EIA			28.7	EIA	n/c
22	Saudi Arabia	Fathalla	1998	Pregnant women	xxs	74405	Good	18-40	6.1	ELISA					Prior
22	Saudi Arabia	Fathalla	1998	Children	xxs	12360	Good	0-15	4.8	ELISA					Prior
22	Saudi Arabia	Fathalla	1998	Male blood donors	xxs	126863	Good	18-49	6.8	ELISA					Prior
23	Saudi Arabia	Mehdi	2000	Male blood donors	xxs	11007	Good	18-60	3.4	ELISA					n/c
24	Saudi Arabia	Al-Sebayel	2002	Liver donors	xxs	145	Reasonable	Unknown					35.2	NS	n/c
25	Saudi Arabia	Ayoola	2003	Blood donors	xxs	14883	Good	Unknown	5.4	EIA					Post
25	Saudi Arabia	Ayoola	2003	General pop	xxs	1172	Good	Unknown	5.1	EIA					Post
25	Saudi Arabia	Ayoola	2003	Hospital patients	xxs	4692	Good	Unknown	9.7	EIA					Post
26	Saudi Arabia	Al-Mazrou	2004	Pregnant women	xxs	2664	Good	Unknown	2.46	ELISA					Concurrent
27	Saudi Arabia	Jaber	2006	School children	xxs	527	Reasonable-Good	4-14					75.0	ELISA	Recommend

28	Saudi Arabia	Alrowaily	2008	Pregnant women	xxs	755	Good	Unknown	1.6	ELISA					Recommend
29	Saudi Arabia	El Beltagy	2008	Blood donors	xxs	3192	Reas-Good	18-52	3.0	EIA			18.7	EIA	Recommend
30	Saudi Arabia	Al-Wayli	2009	Hospital patients	xxs	79858	Reasonable	Unknown	3.1	NS					Concurrent
31	Tunisia	Triki	1997	Male military recruits	xxs	31624	Good	20-25	6.3	ELISA					Recommend
31	Tunisia	Triki	1997	General pop	xxs	785	Good	0-60	6.5	ELISA					Recommend
31	Tunisia	Triki	1997	Infants	xxs	477	Good	3 months	.4	ELISA					Recommend
31	Tunisia	Triki	1997	Mothers	xxs	477	Good	Unknown	3.8	ELISA					Recommend
32	United Arab Emirates	Al-Owais	2000	General pop	xxs	8713	Reasonable	5-80	2.8	MEIA					Prior
33	West Bank/Gaza Strip	Nashef	1992	General pop	xxs	778	Good	0-50	1.8	ELISA					Prior
WHO EMR-D Region															
1	Djibouti[c]	Dray	2005	Blood donors	xxs	9006	Good	Unknown	10.4	ELISA					n/c
2	Egypt	Kamel	1994	General pop	xxs	1259	Good	0-69	2.1	EIA					n/c
3	Egypt	Darwish	1996	General pop	xxs	153	Poor-Reason	1-67+	1.3	EIA					n/c
4	Egypt	El-Nawawy	1996	Pregnant women	xxs	150	Reas-Good	Unknown	8	EIA	0	EIA			Recommend
4	Egypt	El-Nawawy	1996	Newborns	xxs	12	Reas-Good	Unknown	17	EIA	0	EIA			Recommend
5	Morocco[c]	Boulaajaj	2005	Haemodialysis patients	xxs	186	Reasonable	Unknown	2.2	ELISA					Recommend
6	Pakistan	Kakepoto	1996	Blood donors	xxs	51257	Good	16-68	2.3	MEIA					Concurrent
7	Pakistan	Abbas	1997	Children	xxs	664	Reas-Good	0-12	3.6	ELISA					n/c
8	Pakistan	Luby	1997	General pop	xxs	291	Good	0-60+	4.3	EIA			31	EIA	n/c
9	Pakistan	Akhtar	2005	Blood donors	xxs	351309	Good	Unknown	2.0	ELISA					n/c
10	Pakistan	Abbas	2006	General pop	xxs	11372	Good	11-66	4.3	IC	20	IC			Recommend
11	Pakistan	Jafri	2006	Children	xxs	3533	Good	1-15	1.8	ELISA					Recommend
12	Pakistan	Quddus	2006	Afghan refugees	xxs	903	Good	0-50+	8.3	IA					Recommend
13	Pakistan	Mahboob	2007	General pop	xxs	200	Poor-Reason	Unknown	3.5	ELISA					n/c
13	Pakistan	Mahboob	2007	Lichen planus patients	xxs	200	Poor-Reason	Unknown	1.5	ELISA					n/c
14	Pakistan	Sami	2009	Pregnant women	xxs	5902	Reasonable	Unknown	4.6	EIA					Recommend
14	Pakistan	Sami	2009	Gynecological surgery patients	xxs	548	Reasonable	Unknown	12	EIA					Recommend
15	Somalia	Bile	1992	Children	xxs	672	Good	1-15	15	NS					n/c
16	Somalia[e]	Mohamud	1992	General pop	xxs	1272	Reasonable	0-83	19.2	EIA					n/c
17	Somalia	Nur	2000	Blood donors	xxs	115	Reas-Good	18-40	19	NS					Recommend
17	Somalia	Nur	2000	Hospitalized adults	xxs	47	Reas-Good	17-66	21	NS					Recommend
17	Somalia	Nur	2000	Hospitalized children	xxs	36	Reas-Good	0-9	5.6	NS					Recommend
18	Sudan	Elshafie	1992	Male blood donors	xxs	110	Reasonable	Unknown	17	RPHA					n/c
19	Sudan	Fahal	1995	General pop	xxs	150	Poor	8-80	12	ELISA			13	ELISA	n/c
20	Sudan	Khalil	1996	Blood donors	xxs	1217	Reasonable	18-55	4	CIEP					n/c
WHO EUR-A Region															
1	Belgium	Beutels	1997	General pop	xxs	3866	Poor	0-65	.7	RIA			.6	RIA	Recommend
2	Belgium	Quoilin	2007	General pop	xxs	1834	Reasonable	0-65+	0.66	ELISA					Recommend
3	Croatia	Jelic	1994	General pop	xxs	2142	Poor-Reason	0-51	1.8	ELISA					Recommend
4	Croatia	Ivic	1999	Pregnant women	xxs	400	Good	17-43	.75	ELISA			7.5	MEIA	n/c
5	Cyprus	Kurugl	2009	General Turkish pop	xxs	585	Good	1-30	0.85	ELISA			13.2	ELISA	Post
5	Cyprus	Kurugl	2009	General Turkish pop under 8 yr/old	xxs	142	Good	1-7	0	ELISA			7.0	ELISA	Post
6	Denmark	Nelsing	1995	Adult patients	xxs	466	Good	18-96	.85	ELISA			11.8	ELISA	Recommend
7	Denmark[e]	Dickmeiss	2001	Blood donors	xxs	100	Poor-Reason	18-60	0	ELISA					n/c
8	France[e]	Ranger	1990	Pregnant women	xxs	9570	Good	13-47	.54	ELISA	27	ELISA			n/c
8	France[e]	Ranger	1990	Male blood donors	xxs	72769	Good	Unknown	.05	ELISA					n/c
8	France[e]	Ranger	1990	Female blood donors	xxs	60049	Good	Unknown	.03	ELISA					n/c
9	France[e]	Soulie	1991	Pregnant women	xxs	6605	Good	Unknown	2.3	IA	14.0	EIA			Recommend
10	France	Goudeau	1995	General pop	xxs	5641	Reas-Good	6-60	.2	NS			.5	NS	Concurrent
11	France[e]	Pillonel	1998	First time blood donors	xxs	416000	Good	18-65	.17	NS					n/c
11	France[e]	Pillonel	1998	Repeat blood donors	xxs	1347000	Good	18-65	.002	NS					n/c
12	France[e]	Monchar-mont	2000	Blood donors	xxs	12456	Good	18-65					1.3	RIA	n/c
13	France	Denis	2004	Pregnant women	xxs	22859	Good	14-40+	0.65	IA					Recommend

Appendix B (*Continued*)

	Country	Source	Source Year	Population studied	Study design[a]	Sample size	Study quality	Age range	HBsAg prevalence (%)	Testing Method Used	HBeAg prevalence[b] (%)	Testing Method Used	Anti-HBc prevalence[c] (%)	Testing Method Used	Vaccination Intervention[d]
14	France	Zarski	2006	Chronic Hepatitis B patients	xxs	865	Good	Unknown			72.0	ELISA			n/c
15	France	Larsen	2008	HIV patients	xxs	1849	Reasonable	Unknown	7.0	NS			23.7	NS	Recommend
16	Germany	Peterson	1992	Blood donors	xxs	381	Good	Unknown	0	NS			3.8	NS	Recommend
17	Germany	Bolke	1995	Young adults	xxs	1600	Reas-Good	19-27	.4	RIA			7.1	RIA	n/c
17	Germany	Bolke	1995	Adults	xxs	400	Reas-Good	>50	1.5	RIA			32.5	RIA	n/c
18	Germany[e]	Niesert	1996	Pregnant women	xxs	912	Reasonable	Unknown	1.4	EIA			6.4	EIA	n/c
19	Germany	Jilg	2001	General adult pop	xxs	5305	Reas-Good	18-70	.6	MEIA			8.7	MEIA	Concurrent
20	Germany	Knorr	2008	Women of reproductive age	xxs	5518	Poor-Reas	16-45	1.6	IA	8.0	IA			Recommend
21	Greece	Dalekos	1996	General pop	ccs	1342	Poor	Unknown	2.1	EIA			19.5	EIA	n/c
22	Greece	Lionis	1997	Children	xxs	304	Good	5-16	.3	MEIA			2.3	MEIA	Recommend
23	Greece (Crete)	Lionis	1997	General adult pop	xxs	257	Poor	15+	1.2	MEIA			24.5	MEIA	Prior
23	Greece (Crete)	Lionis	1997	General pop	xxs	164	Poor	1-65+	0	MEIA			9.8	MEIA	Prior
24	Greece[e]	Doutsos	1998	Medical students	xxs	494	Reasonable	Unknown	1.2	MEIA					Prior
25	Greece[e]	Gioka	1998	Adults	xxs	261	Reasonable	Unknown	0	MEIA			8.4	MEIA	Prior
26	Greece[e]	Zervou	1998	Blood donors	xxs	6696	Good	18-60	.85	MEIA					Concurrent
27	Greece (Crete)	Koulentaki	1999	Adult blood donors	xxs	65219	Reas-Good	<20-60	.4	MEIA					n/c
28	Greece	Stamouli	1999	Young male pop	xxs	1050	Reasonable	18-25	.95	MEIA	20	MEIA	1.0	MEIA	Concurrent
29	Greece	Kyriakis	2000	General pop	xxs	288129	Reas-Good	18-61	.8	EIA					Concurrent
30	Greece	Dounias	2005	Municipal solid waste workers	xxs	166	Poor-Reas	Unknown	7.2	ELISA					Recommend
31	Greece	Papaevange-lou	2008	Children	xxs	1286	Poor-Reas	0-14	0.6	ELISA			5.6	ELISA	Post
32	Iceland	Briem	1990	Outpatients	xxs	455	Poor-Reason	Unknown	.14	ELISA			5.4	ELISA	Recommend
33	Israel	Bar-Shany	1991	Male blood donors	xxs	39011	Reas-Good	18-65	1.1	ELISA					Recommend
33	Israel	Bar-Shany	1991	Female blood donors	xxs	10196	Reas-Good	18-65	.44	ELISA					Recommend
34	Israel	Bogomolski	1991	Pregnant women	xxs	11123	Reas-Good	Unknown	.9	RIA & EIA	1.6	RIA & EIA			Prior
35	Israel	Isacsohn	1994	Pregnant women	xxs	6572	Good	Unknown	.6	EIA					Recommend
36	Israel	Glikberg	1997	Migrant pop	xxs	102	Poor	17-84	15.7	EIA					n/c
37	Italy	Stroffolini	1990	Adolescents	xxs	1357	Good	14-19	1.1	NS					n/c
38	Italy	Chiaramonte	1991	Children	xxs	1635	Good	6-15	.1	ELISA			.1	ELISA	Concurrent
39	Italy	Stroffolini	1991	Children	xxs	7405	Good	3-19	.6	ELISA					Prior
40	Italy	D'Amelio	1992	Male military recruits	xxs	4993	Reasonable	18-26	1.6	NS			5.8	NS	Recommend
41	Italy	Puro	1992	Pregnant women	xxs	1142	Poor-Reason	14-47	1.6	ELISA			14.4	ELISA	Recommend
42	Italy	Adamo	1998	Pregnant women	xxs	1887	Good	Unknown	2.5	NS					Post
43	Italy	Baldo	2000	Pregnant women	xxs	2059	Good	16-50	1.0	EIA					n/c
44	Italy	Bruno	2007	Medical students	xxs	2137	Poor-Reason	Unknown					1.0	EIA	n/c
45	Italy	Manzini	2007	Blood donors	xxs	6313	Good	18-69					4.85	MEIA	Recommend
46	Italy	Majori	2008	Sub-Saharan immigrants	xxs	182	Poor	0-60	9.3	EIA			58.3	EIA	Recommend
47	Italy	Raimondo	2008	Individuals w/o hepatic disease	xxs	98	Poor	Unknown					16.3	EIA	n/c
48	Italy	Trevisan	2008	Medical school students	xxs	2361	Poor-Reason	Unknown					1.0	EIA	Recommend
49	Italy	Camoni	2009	Drug users	xxs	1330	Good	Unknown	24.6	EIA			46.2	EIA	Recommend
50	Italy	Scognamiglio	2009	General adult pop	xxs	577	Reasonable	23-26					3.3	EIA	Recommend
51	Italy	Stratta	2009	Renal transplant candidates	xxs	300	Poor-Reason	20-75	71.0	NS					n/c
52	Netherlands	Grosheide	1995	Pregnant women	xxs	99706	Good	Unknown	.7	RIA & ELISA	16.7	RIA & ELISA			n/c
53	Portugal[e]	Santos	2000	Adults	xxs	657	Reas-Good	20-65	.91	ELISA			1.82	ELISA	Recommend
54	Republic of Ireland	O'Connell	2000	General pop	xxs	1714	Good	0-65+	0	IA			.29	IA	n/c
55	Spain	del Olmo	1990	Prison staff	xxs	154	Reasonable	18-60	1.3	EIA					Recommend
56	Spain[e]	Delgado-San-chez	1990	Pregnant women	xxs	454	Reas-Good	Unknown	3.1	NS					Recommend
57	Spain[e]	Munoz Calvo	1990	Healthy children	xxs	375	Reas-Good	6-14	1.3	ELISA			4.0	ELISA	Prior
58	Spain	Dal-Re	1991	General pop	xxs	497	Poor	0-75	.8	ELISA			1.4	ELISA	Concurrent
59	Spain	Salleras	1992	Children	xxs	1017	Good	6-14	.5	NS					Prior

59	Spain	Salleras	1992	General adult pop	xxs	661	Good	15-65+	1.7	NS					Prior
60	Spain[e]	Virto Ruiz	1993	Cigane pop	xxs	245	Reasonable	0-75	27	ELISA					Recommend
60	Spain[e]	Virto Ruiz	1993	Gypsy pop	xxs	127	Reasonable	0-78	0	ELISA					Recommend
60	Spain[e]	Virto Ruiz	1993	General pop	xxs	103	Reasonable	3-82	.9	ELISA					Recommend
61	Spain[e]	Panizo-Delgado	1994	Pregnant women	xxs	2499	Reasonable	14-45	.7	EIA	16.6	EIA	7.5	EIA	Prior
62	Spain[e]	Suarez	1994	Blood donors	xxs	42789	Good	18-65	.16	ELISA					Recommend
63	Spain[e]	Cortes	1995	Adolescents	xxs	262	Reasonable	12-15	.38	ELISA	16.7	MEIA	1.1	ELISA	Recommend
64	Spain[e]	Bayas	1996	Health science students	xxs	1734	Reasonable	Unknown					2.5	ELISA	Recommend
65	Spain	Garcia-Fulgueiras	1996	General adult pop	xxs	2203	Reasonable	18-65	.9	ELISA			10.2	ELISA	n/c
66	Spain[e]	Suarez	1996	Young adults	xxs	433	Reasonable	6-25	.46	ELISA			1.8	ELISA	Recommend
67	Spain[e]	Suarez	1997	Adults	xxs	331	Reas-Good	26-65	1.2	ELISA			11.8	ELISA	Recommend
68	Spain	Gil	1998	Urban adolescents	xxs	642	Reasonable	14-17					3.7	ELISA	Recommend
68	Spain	Gil	1998	Rural adolescents	xxs	547	Reasonable	14-17					2.2	ELISA	Recommend
69	Spain	Santana Rodriguez	1998	Non-injection drug users	xxs	263	Poor-Reason	15-58	2.7	ELISA			20.7	ELISA	n/c
70	Spain	Dominguez	2000	General pop	xxs	2142	Good	5-64+	1.2	ELISA			9.1	ELISA	Concurrent
71	Spain[c]	Sola	2002	General pop	xxs	2194	Reas-Good	25-74	1.7						n/c
72	Spain	Enriquez	2007	Glomerular disease patiants	xxs	89	Poor	Unknown	0.0	EIA			9.0	EIA	n/c
72	Spain	Enriquez	2007	Blood donors	xxs	59546	Poor	Unknown	0.28	EIA					n/c
73	Spain	Salleras	2007	General pop	xxs	2620	Good	5-65+	0.7	ELISA			8.7	ELISA	Post
74	Spain	Solves	2008	Blood donors	xxs	6855	Good	Unknown	0.68	IA			11.4	EIA	n/c
75	Spain[c]	Valerio	2008	Recent immigrants	xxs	791	Poor-Reas	Unknown	5.9	EIA			33	EIA	n/c
76	Spain	Vallejo	2008	Non-injecting heroin users	xxs	276	Poor-Reason	< 30					17.2	EIA	Recommend
76	Spain	Vallejo	2008	Injecting heroin users	xxs	460	Poor-Reason	< 30					22.5	EIA	Recommend
77	Spain	Loras	2009	Chrohn's disease patients	xxs	1128	Good	Unknown	0.6	ELISA			7.1	ELISA	Recommend
77	Spain	Loras	2009	Ulcerative colitis patients	xxs	928	Good	Unknown	0.8	ELISA			8.0	ELISA	Recommend
78	Spain	Marcos	2009	Sjogren's syndrome patients	xxs	603	Good	31-89	0.83	ELISA					n/c
79	Sweden	Struve	1992	General adult pop	xxs	4000	Good	12-54	.25	RIA			1.8	RIA	Recommend
80	Sweden	Christenson	1997	Adults	xxs	3382	Good	18-90	.06	EIA			2.6	EIA	n/c
81	Sweden	Hoffman	2000	Adults	xxs	5533	Good	Unknown	.2	ELISA			4.2	ELISA	n/c
82	Switzerland	Bart	1996	Pregnant women	xxs	9006	Good	15-51	.8	EIA			7.1	EIA	Recommend
83	United Kingdom	Boxall	1994	Pregnant women	xxs	3522	Good	Unknown	.6	RIA					Recommend
84	United Kingdom	Hesketh	1997	Children	xxs	2025	Good	13-14	.15	ELISA					Recommend
85	United Kingdom	Gay	1999	Adults	xxs	3781	Good	15-44					3.9	EIA	Prior
86	United Kingdom	Aweis	2001	Somali pop in Liverpool	xxs	439	Poor-Reason	0-80	5.7	ELISA			27.5	ELISA	Recommend
87	United Kingdom	Kawsar	2002	Chinese pop	xxs	117	Poor	17-69	12.8	NS			58.8	NS	Recommend
88	United Kingdom (Scotland)	McMillan	2006	MSM who attended an STI clinic	xxs	3334	Reasonable	Unknown	1	IA			12	IA	Recommend
WHO EUR-B Region															
1	Albania	Da Villa	1995	General pop	xxs	1348	Poor	Unknown	11.7	IA	15.8	IA	57.9	IA	Recommend
1	Albania	Da Villa	1995	Children	xxs	46	Poor	0-5	15.2	IA			56.5	IA	Recommend
1	Albania	Da Villa	1995	Pregnant women	xxs	196	Poor	Unknown	11.7	IA	17.4	IA	71.4	IA	Recommend
2	Albania	Resuli	2009	Schoolchildren	xxs	410	Good	Unknown	11.8	ELISA					Recommend
2	Albania	Resuli	2009	Students	xxs	666	Good	Unknown	8.7	ELISA					Recommend
2	Albania	Resuli	2009	Military personnel	xxs	500	Good	Unknown	10.6	ELISA					Recommend
2	Albania	Resuli	2009	Casual blood donors	xxs	1286	Good	Unknown	8.9	ELISA					Recommend
2	Albania	Resuli	2009	Voluntary blood donors	xxs	378	Good	Unknown	9.6	ELISA					Recommend
2	Albania	Resuli	2009	Pregnant women	xxs	640	Good	Unknown	7.3	ELISA					Recommend
3	Bosnia & Herzegovina	Puvacic	1991	Pregnant women	xxs	63	Poor	17-39	4.8	NS					Recommend
4	Bulgaria	Vassilev	2006	Intravenous drug users	xxs	773	Poor-Reason	Unknown	6	ELISA					n/c
5	Georgia	Badridze	2008	HIV positive patients	xxs	175	Reasonable	20-77	6.9	ELISA			43.4	ELISA	Recommend
6	Greenland	Langer	1997	General pop	xxs	503	Good	7-79	7	IA			42	IA	n/c

Appendix B (*Continued*)

	Country	Source	Source Year	Population studied	Study design[a]	Sample size	Study quality	Age range	HBsAg prevalence (%)	Testing Method Used	HBeAg prevalence[b] (%)	Testing Method Used	Anti-HBc prevalence[c] (%)	Testing Method Used	Vaccination Intervention[d]
7	Poland	Chlabicz	2006	Social assistance home patients	xxs	1163	Poor-Reason	Unknown	2.8	ELISA					Recommend
8	Poland[c]	Grzegorzewska	2008	Hemodialysis patients	xxs	1140	Reasonable	Unknown	3.4	NS			32.7	NS	n/c
9	Romania[e]	Iacob	1993	Blood donors	xxs	2049	Reasonable	Unknown	3.8	ELISA					Concurrent
10	Romania	Paquet	1993	Children	xxs	201	Reasonable	0-16	19.9	ELISA					Recommend
10	Romania	Paquet	1993	Pregnant women	xxs	204	Reasonable	14-42	7.8	ELISA					Recommend
10	Romania	Paquet	1993	Adults	xxs	200	Reasonable	16-82	11	ELISA					Recommend
11	Romania	Woodruff	1993	Pregnant women	xxs	573	Good	15-45	8.4	RIA	2.0	RIA	28	RIA	Prior
12	Romania[e]	Bocsan	1994	Orphanage children	cos	173	Poor-Reason	Unknown	24.8	ELISA					Post
13	Romania[e]	Beldescu	1995	General pop	xxs	869	Reasonable	1-60+	20.7	ELISA					n/c
14	Romania[e]	Debeleac	1995	Patients	xxs	7589	Good	Unknown	13.7	ELISA					n/c
15	Romania	Molnar	1995	Pregnant women	xxs	2354	Good	Unknown	3.8	ELISA	8.9	ELISA			Recommend
16	Romania[e]	Iancu	1997	Children	xxs	517	Reasonable	0-14+	24.28	ELISA					Recommend
17	Romania[e]	Balan	1998	Pregnant women	xxs	1298	Reasonable	<20-40+	12.2	ELISA			25.3	ELISA	Recommend
18	Romania	Brehar-Cioflec	1998	General pop	xxs	226	Poor	Unknown	19.9	EIA			55.3	EIA	n/c
19	Romania	Ruta	2005	HIV positive adolescents	xxs	161	Reasonable	13-18	43.4	EIA	25.7	EIA	78.3	EIA	Post
19	Romania	Ruta	2005	Adolescent pop	xxs	356	Reasonable	13-18	7.9	EIA	28.6	EIA	31.7	EIA	Post
20	Romania[c]	Duca	2007	General pop	xxs	220	Poor-Reason	20+	33.2	NS			25.4	NS	n/c
21	Turkey[e]	Mistik	1993	Pregnant women	xxs	602	Poor	Unknown	3.1	ELISA	21	ELISA			n/c
21	Turkey[e]	Mistik	1993	Infants of HBsAg + mothers	xxs	19	Poor	0-1	31	ELISA	33.3	ELISA			n/c
22	Turkey	Cetinkaya	1995	Children	xxs	1316	Poor-Reason	0-10+	3.2	ELISA					Recommend
23	Turkey[e]	Poyraz	1995	General pop	xxs	400	Poor	Unknown	7.5	ELISA			4.2	ELISA	n/c
24	Turkey[e]	Kilic	1996	Adults	xxs	532	Reasonable	19-68	7.5	ELISA					Recommend
25	Turkey	Kuru	1995	General pop	xxs	801	Good	0-60	12	ELISA			37.8	ELISA	Prior
26	Turkey	Kuru	1996	Pregnant women	xxs	5366	Reasonable	Unknown	4.2	EIA	6.2	EIA			n/c
27	Turkey	Nas	1999	Pregnant women	xxs	3050	Poor-Reason	17-39	1.3	NS					n/c
28	Turkey[e]	Sayiner	1999	General pop	xxs	1920	Reasonable	Unknown	3.1	RPHA					n/c
29	Turkey	Okan	2002	Type 2 diabetic patients	xxs	692	Good	Unknown	5.3	ELISA				Recommend	
29	Turkey	Okan	2002	Blood donors	xxs	1014	Good	Unknown	5.1	NS					Recommend
30	Turkey	Erden	2003	Hospital patients	xxs	1157	Good	15-85	6.6	ELISA					Recommend
31	Turkey	Erol	2003	Family members of HbsAg positive individuals	xxs	244	Poor-Reason	Unknown	29.6	ELISA			43.8	ELISA	n/c
31	Turkey	Erol	2003	Blood donors	xxs	384	Poor-Reason	Unknown	9.6	ELISA			29.7	ELISA	n/c
32	Turkey	Mehmet	2005	General pop	xxs	3000	Good	15-64+	7.0	MEIA			47.4	MEIA	n/c
33	Turkey	Gurol	2006	Blood donors	xxs	6240130	Good	Unknown	4.19	ELISA					Recommend
34	Turkey	Guven	2006	Workers with no known occupational exposure	xxs	571	Reasonable	21-51	6.6	ELISA			50.6	ELISA	n/c
35	Turkey	Ucmak	2007	Family members of HbsAg positive patients	xxs	2113	Reasonable	Unknown	30.5	EIA					n/c
36	Turkey	Demir	2008	Type 2 diabetes patients	xxs	576	Good	Unknown	3.9	MEIA					n/c
37	Turkey	Okan	2008	Lymphoproliferative disorder patients	xxs	334	Poor	Unknown	6.2	ELISA					n/c
37	Turkey	Okan	2008	Blood donors	xxs	1014	Poor	Unknown	4.9	ELISA					n/c
38	Turkey	Yildirim	2009	General pop	xxs	1095	Reas-Good	18-95	5.5	EIA			12.1	EIA	n/c
WHO EUR-C Region															
1	Belarus[e]	Kalinin	1998	Patients	xxs	26740	Reasonable	0-50	5.1	NS					n/c
2	Hungary	Ordog	2003	Family members of pregnant women HBV carriers	xxs	391	Poor	Unknown	27.1	ELISA			50.4	ELISA	n/c
3	Lithuania[e]	Caplinskas	2000	Adolescents	xxs	632	Poor	14-19	1.42	NS					n/c
4	Lithuania	Kupcinskas	2007	Soldiers	xxs	1830	Poor-Reason	Unknown	2.0	NS					Recommend

5	Moldova	Drobeniuc	1999	Children	xxs	439	Good	0-6	6.8	RIA			17.1	RIA	Prior
5	Moldova	Drobeniuc	1999	Pregnant women	xxs	1098	Good	Unknown	9.7	RIA	35.6	EIA	52.4	RIA	Prior
6	Russian Federation[e]	Aryamkina	1990	Blood donors	xxs	3358	Good	23-44	1.3	NS					n/c
7	Russian Federation[e]	Kuzin	1990	Pregnant women (Moscow)	xxs	18652	Reasonable	Unknown	1.1	NS	5.2	NS			Recommend
7	Russian Federation[e]	Kuzin	1990	Pregnant women (Uzbekistan)	xxs	6142	Reasonable	Unknown	6.9	NS	13.9	NS			Recommend
8	Russian Federation[e]	Frolov	1991	General pop	xxs	3258	Poor-Reason	Unknown	3.8	RIA			31.4	RIA	n/c
9	Russian Federation[e]	Yashina	1992	Blood donors (Moscow)	xxs	1040	Reasonable	0-70	2.0	NS			4.5	NS	n/c
9	Russian Federation[e]	Yashina	1992	Blood donors (Osh District)	xxs	979	Reasonable	0-70	10.3	NS			14.0	NS	n/c
10	Russian Federation[e]	Dvornikov	1995	General pop	xxs	1287	Poor	0-88	8.3	EIA					n/c
11	Russian Federation[e]	Sailov	1995	Hospital patients	xxs	20535	Reasonable	Unknown	4.2	NS			6.2	NS	n/c
12	Russian Federation	Ohba	1999	Adults	xxs	348	Reas-Good	16-82	11.8	PA					Recommend
13	Russian Federation[c]	Fedorchenko	2008	Blood donors	xxs	14366	Good	Unknown					6.8	NS	n/c
14	Ukraine[e]	Schastnyi	1996	Students	xxs	1508	Reasonable	0-15	1.6	NS					n/c
WHO SEAR-B Region															
1	Indonesia	Amirudin	1991	Adults	xxs	196	Reasonable	0-59	7.1	RPHA & EIA			76	HI	n/c
2	Indonesia	Budihusodo	1991	Blood donors	xxs	243	Reasonable	Unknown	5.8	RPHA			59.3	HI	n/c
3	Indonesia	Sulaiman	1995	Adults	xxs	3839	Reas-Good	11-76	8.8	ELISA					n/c
4	Indonesia	Surya	2005	Pregnant women	xxs	2450	Poor-Reason	16-45	1.9	RPHA	28.3	ELISA			n/c
5	Sri Lanka	Padmasiri	1995	General pop	xxs	1913	Good	< 6 mo	2.5	ELISA					Recommend
6	Thailand	Tanprasert	1993	Blood donors	xxs	74,530	Reasonable	Unknown	6.45	RPHA					Recommend
7	Thailand[e]	Vithayasai	1993	College students	xxs	1010	Reasonable	Unknown	9.61	RPHA					n/c
8	Thailand	Nelson	1994	General pop	xxs	961	Good	0-60+	24.8	ELISA					n/c
9	Thailand	Luksamijar-ulkul	1995	Children	xxs	165	Reasonable	6-14	3.6	EIA			6.1	EIA	Recommend
10	Thailand	Songsivilai	1997	Blood donors	xxs	3255	Good	17-68	4.9	EIA					n/c
11	Thailand[e]	Bejrachandra	1998	Blood donors	xxs	274288	Good	Unknown	1.13	ELISA					n/c
12	Thailand	Chub-uppa-karn	1998	Children	xxs	180	Good	0-15	.55	ELISA			3.3	ELISA	Post
13	Thailand	Ikeda	1998	Females	xxs	52	Reasonable	19-57	0	RIA			25	RIA	n/c
14	Thailand	Kozik	2000	Children	xxs	1,903	Good	4-15	16	NS			27	NS	Recommend
15	Thailand	Chongsrisa-wat	2006	General pop	xxs	6213	Reas-Good	0-60	4	ELISA			26.5	ELISA	Post
15	Thailand	Chongsrisa-wat	2006	Children born after immunization intervention	xxs	2303	Reas-Good	0-18	0.7	ELISA			2.9	ELISA	Post
15	Thailand	Chongsrisa-wat	2006	Children born before immunization intervention	xxs	584	Reas-Good	18	4.3	ELISA			15.8	ELISA	Post
WHO SEAR-D Region															
1	Bangladesh	Akhter	1992	Pregnant women	xxs	500	Reas-Good	Unknown	3.6	RPHA					n/c
2	Bangladesh	Laskar	1997	School girls	xxs	836	Reasonable	6-15	2.3	LATEX					n/c
2	Bangladesh	Laskar	1997	School girls	xxs	836	Reasonable	6-15	.8	ELISA					n/c
3	Bangladesh	Rahman	1997	General pop	xxs	1000	Good	Unknown	6.4	LATEX					n/c
4	Bangladesh	de Francisco	1999	Infants	xxs	334	Good	<1	.3	ELISA	0	ELISA	10.5	ELISA	n/c
4	Bangladesh	de Francisco	1999	Pregnant women	xxs	330	Good	15-35+	5.4	ELISA	22	ELISA	32.4	ELISA	n/c
5	Bhutan	Da Villa	1997	General pop	xxs	1,666	Good	0-24+	5.9	RIA			63.1	RIA	Recommend
5	Bhutan	Da Villa	1997	Pregnant women	xxs	440	Good	Unknown	5.4	RIA	29	ELISA			Recommend
6	India	Joshi	1990	School children	xxs	1314	Reasonable	6-18	15.7	RPHA					n/c
7	India	Sarkar	1990	Newborns	xxs	150	Poor-Reason	<1	5.3	ELISA					n/c
8	India	Singhvi	1990	Blood donors	xxs	2702	Reasonable	Unknown	1.4	RPHA & ELISA					n/c
8	India	Singhvi	1990	Replacement donors	xxs	32693	Reasonable	Unknown	2.96	RPHA & ELISA					n/c
9	India	Thakur	1990	General pop	xxs	2405	Reasonable	Unknown	6.8	RPHA					n/c

Appendix B (*Continued*)

	Country	Source	Source Year	Population studied	Study design[a]	Sample size	Study quality	Age range	HBsAg prevalence (%)	Testing Method Used	HBeAg prevalence[b] (%)	Testing Method Used	Anti-HBc prevalence[c] (%)	Testing Method Used	Vaccination Intervention[d]
10	India	Elavia	1991	Blood donors	xxs	10433	Reas-Good	Unknown	2.0	RPHA					n/c
10	India	Elavia	1991	Medical personnel	xxs	606	Reas-Good	Unknown	6.6	RPHA					n/c
11	India	Tandon	1991	Children	xxs	982	Good	0-5	2.1	ELISA					Prior
12	India	Thakur	1991	Blood donors	xxs	1274	Reasonable	Unknown	2.6	ELISA					n/c
13	India	Irshad	1992	Blood donors	xxs	1117	Reas-Good	Unknown	5.7	RPHA & LATEX					n/c
14	India	Jain	1992	Patients	xxs	202	Poor	Unknown	11.3	RPHA					n/c
15	India	Satoskar	1992	Blood donors	xxs	3014	Reasonable	18-65	4.7	ELISA					n/c
16	India	Dutta	1994	Hospital patients	xxs	184	Poor	1-60+	28.3	ELISA					Recommend
17	India	Irshad	1994	Adult blood donors	xxs	20435	Reasonable	Unknown	2.6	ELISA					Recommend
18	India	Jain	1994	Pregnant women	xxs	252	Reasonable	Unknown	3.6	RPHA					n/c
19	India	Choudhury	1995	Blood donors	xxs	313	Good	19-52	2.2	ELISA			18.2	ELISA	n/c
20	India	Gill	1995	Pregnant women	xxs	2000	Good	<20-50	5	IA	12	ELISA			Recommend
21	India	Jain	1995	Blood donors	xxs	3166	Good	Unknown	1.8	NS					n/c
22	India	Reddy	1995	General pop	xxs	91	Poor-Reason	Unknown	4.4	ELISA			33	RIA	n/c
23	India	Thapa	1995	Children	xxs	334	Good	3-15	1	ELISA					n/c
24	India	Kaur	1996	College students	xxs	818	Reasonable	16-32	2.9	NS					n/c
25	India	Mittal	1996	Pregnant women	xxs	850	Reasonable	16-38	4.6	RPHA	18	RPHA			n/c
25	India	Mittal	1996	Pregnant women	xxs	850	Reasonable	16-38	6.3	ELISA					n/c
26	India	Sharma	1996	Newborns	xxs	157	Good	<1	5	RPHA					n/c
26	India	Sharma	1996	Pregnant women	xxs	157	Good	Unknown	10	RPHA					n/c
27	India	Nanu	1997	Blood donors	xxs	132093	Good	Unknown	1.9	ELISA					n/c
28	India	Sriprakash	1997	Pregnant women	xxs	520	Reas-Good	Unknown	4.6	ELISA					n/c
29	India	Prakash	1998	Pregnant women	xxs	1112	Good	Unknown	9.5	ELISA	12	ELISA			Recommend
30	India	Chowdhury	1999	General pop	xxs	960	Good	0-84	5.3	EIA			13	EIA	n/c
31	India	Mohite	1999	Patients	xxs	170	Poor	Unknown	7.7	ELISA					Concurrent
31	India	Mohite	1999	Hospital employees	xxs	166	Poor	Unknown	1.9	ELISA					Concurrent
31	India	Mohite	1999	Blood donors	xxs	1042	Poor	Unknown	2.1	ELISA					Concurrent
32	India	Chandrase-karan	2000	Blood donors	xxs	1819	Reasonable	Unknown	4	ELISA					n/c
32	India	Chandrase-karan	2000	Hospital staff	xxs	75	Reasonable	Unknown	5.3	ELISA					n/c
33	India	Murhekar	2000	Nicobarese tribal pop	xxs	1144	Good	5-80	23.3	ELISA					Recommend
33	India	Murhekar	2000	Shompens tribal pop	xxs	37	Good	Unknown	37.8	ELISA					Recommend
33	India	Murhekar	2000	Onges tribal pop	xxs	58	Good	Unknown	31.0	ELISA					Recommend
33	India	Murhekar	2000	Andamanese tribal pop	xxs	27	Good	Uknown	3.7	ELISA					Recommend
34	India	Singh	2000	General pop	xxs	1553	Good	0-40+	3.7	ELISA					Recommend
35	India	Ahmad	2001	Adults	xxs	946	Poor-Reason	Unknown	2.4	ELISA					Prior
36	India	Kalaivani	2001	General tribal pop	xxs	161	Good	0-90	1.9	ELISA					n/c
37	India	Thakur	2002	Family contacts of chronic liver disease patients	xxs	373	Reasonable	1-50+	17.4	IA					n/c
38	India	Risbud	2002	STD clinic attendees	xxs	497	Poor	<20-30+	3.6	ELISA			43.2	ELISA	Recommend
39	India	Murhekar	2003	Jarawas tribal pop	xxs	64	Reasonable	5+	65.6	ELISA			68.8	ELISA	Recommend
40	India	Murhekar	2004	Children in Andaman and Nicobar Islands	xxs	1574	Good	5-14+	22.5	ELISA					Recommend
41	India	Qamer	2004	Pediatric patients	xxs	460	Poor-Reason	0-14	4.35	ELISA					n/c
42	India	Shenoy	2004	Pregnant women	xxs	300	Poor-Reason	Unknown	4.0	ELISA	8.33	ELISA			n/c
43	India	Singh	2004	Blood donors	xxs	128589	Reasonable	Unknown	1.8	ELISA					n/c
44	India	Chowdhury	2005	General pop	xxs	7653	Good	<10-60+	2.97	EIA					n/c
45	India	Kurien	2005	Tamil Nadu general pop	xxs	1981	Good	15-45	5.7	ELISA	23.5	ELISA			n/c
46	India	Gupta	2006	HIV positive patients	xxs	451	Poor-Reason	5-70	5.3	ELISA					n/c
46	India	Gupta	2006	Blood donors	xxs	428	Poor-Reason	16-67	1.4	ELISA					n/c

47	India	Sandesh	2006	Blood donors	xxs	64823	Good	Unknown	0.71	ELISA					n/c
47	India	Sandesh	2006	Pregnant women	xxs	70659	Good	Unknown	0.25	ELISA					n/c
48	India	Bhattacharya	2007	Blood donors (2004)	xxs	113051	Good	Unknown	1.3	ELISA					n/c
48	India	Bhattacharya	2007	Blood donors (2005)	xxs	106695	Good	Unknown	1.7	ELISA					n/c
49	India	Biswas	2007	Idu Mishmi tribal pop	xxs	438	Good	2-57	21.2	ELISA	36.6	ELISA	92.3	ELISA	n/c
50	India	Carey	2007	Adults seeking treatment for a mental disorder	xxs	948	Poor	18-48+	3.0	ELISA					n/c
51	India	Pahuja	2007	Blood donors	xxs	28956	Good	18-60	2.2	ELISA					Recommend
52	India	Rai	2007	HIV positive patients	xxs	58	Poor	Unknown	1.7	NS			17.2	NS	n/c
53	India	Tripathi	2007	HIV positive patients	xxs	620	Good	25-50	2.25	ELISA					n/c
54	India	Behal	2008	General pop	xxs	20000	Good	19-55	2.25	ELISA					Concurrent
55	India	Jindal	2008	Injection drug users	xxs	157	Reasonable	Unknown	17.8	ELISA					Recommend
55	India	Jindal	2008	Truckers	xxs	100	Reasonable	Unknown	6.0	ELISA					Recommend
55	India	Jindal	2008	STD clinic patients	xxs	350	Reasonable	Unknown	3.7	ELISA					Recommend
56	India	Mahajan	2008	HIV patients	xxs	230	Poor-Reason	Unknown	3.5	ELISA					n/c
57	India	Saravanan	2008	Chronic liver disease patients	xxs	69	Poor	40-65	57	ELISA	26	ELISA			n/c
58	India	Chatterjee	2009	Pregnant women	xxs	36379	Good	Unknown	0.8	ELISA					Recommend
59	Myanmar	Nakai	2001	General blood donors	xxs	213	Reasonable	7-80	8	NS					n/c
60	Nepal	Shrestha	1990	General pop	xxs	2555	Reasonable	0-41+	.9	RPHA			43.5	EIA	n/c
61	Nepal	Rai	1994	General pop	xxs	303	Poor	Unknown	0	RPHA					n/c
62	Nepal	Nakashima	1995	Adults	xxs	676	Good	15-84	.3	RPHA			7.7	RIA	n/c
63	Nepal	Manandhar	1998	General male pop	xxs	478	Reasonable	13-71	3.8	ELISA					n/c
64	Nepal	Sawayama	1999	Adults	xxs	458	Reasonable	15-90	1.1	PHA			7.2	RIA	Recommend
65	Nepal	Joshi	2003	Adult males	xxs	627	Reasonable	17-48	2.7	IC					Recommend
66	Nepal	Srestha	2007	Patients with liver cirrhosis or hepatocellular carcinoma	xxs	121	Reasonable	23-83	40	PHA			70	RIA	n/c
WHO WPR-A Region															
1	Australia	Gill	1990	School children	xxs	607	Reasonable	4-19	.03	EIA					Prior
2	Australia	Gardner	1992	School children	xxs	1104	Good	9-17	.36	EIA					Recommend
3	Australia	Burgess	1993	School children	xxs	2883	Good	11-12	.02	RIA	67	RIA	5.9	RIA	Recommend
4	Australia	Patterson	1993	General pop	xxs	422	Good	Unknown	0				1	RIA	Recommend
4	Australia	Patterson	1993	Aborigines	xxs	310	Good	Unknown	6.1	RIA	15.8	RIA	29.7	RIA	Recommend
5	Australia	Oman	1997	Pregnant women	xxs	63695	Good	Unknown	.52	NS					Recommend
6	Australia	Gibney	2008	Sub-Saharan African immigrants	xxs	383	Reasonable	16-75	22	IA	20	IA	68	IA	Recommend
7	Australia	Schultz	2008	Infant pop in northern territory	xxs	973	Reasonable	Newborn	3.7	NS					n/c
8	Brunei	Alexander	1990	General pop	xxs	22828	Reasonable	Unknown	6.1	EIA					n/c
9	Brunei	Sebastian	1990	Pregnant women	xxs	1267	Reasonable	11-50	3.2	ELISA					n/c
10	Japan	Hayashi	1990	Children	xxs	1529	Reasonable	1-4	.1	RPHA					Concurrent
11	Japan[e]	Sakugawa	1990	General pop	xxs	2231	Reasonable	5-80+	6.3	RPHA	5.7	RIA			Recommend
12	Japan	Ochi	1991	General pop	xxs	579	Reas-Good	9-84	11	RIA					n/c
13	Japan	Akbar	1992	General pop	xxs	1118	Reasonable	4-90	.4	RPHA, PHA, and ELISA					Concurrent
14	Japan	Maeda	1992	Adults males	xxs	122165	Good	16-64	1	RPHA					n/c
14	Japan	Maeda	1992	Adult females	xxs	107248	Good	16-64	.7	RPHA					n/c
15	Japan	Koyama	1997	Adults	xxs	5152	Reas-Good	> 35	.9	PHA					n/c
16	Japan	Furusyo	1998	General pop	xxs	521	Reasonable	0-60+	4.4	RPHA			41.1	RIA	n/c
17	Japan	Hokama	1998	Pregnant women	xxs	2227	Good	Unknown	1.1	NS					Post
18	Japan	Sata	1998	Adults	xxs	509	Good	20-94	2.6	EIA			46	EIA	n/c
19	Japan	Furusyo	2000	General pop	xxs	298	Poor-Reason	3-90					29.2	RIA	n/c
20	Japan	Fujiwara	2003	Atomic bomb survivors	xxs	6121	Poor	<50-70+	1.8	PHA					n/c
21	Japan	Toyoda	2004	Hemophilia patients	xxs	43	Poor	Unknown					86	EIA	n/c
22	Japan	Koike	2008	HIV positive patients	xxs	5998	Poor	Unknown	6.4	NS					n/c
23	Japan	Nagao	2008	Dental care workers	xxs	141	Poor	29-80+					12.1	CLIA	Recommend
24	New Zealand	Welch	1990	Children	xxs	432	Reasonable	14-16	0	EIA			1.7	EIA	Prior
25	New Zealand	Chapman	2000	Adults	xxs	1064	Good	Unknown	.3	ELISA	.66	ELISA			n/c
26	New Zealand	Robinson	2005	General pop	xxs	177328	Poor-Reason	Unknown	5.7	NS					Recommend

Appendix B (*Continued*)

	Country	Source	Source Year	Population studied	Study design[a]	Sample size	Study quality	Age range	HBsAg prevalence (%)	Testing Method Used	HBeAg prevalence[b] (%)	Testing Method Used	Anti-HBc prevalence[c] (%)	Testing Method Used	Vaccination Intervention[d]
WHO WPR-B Region															
1	American Samoa	Mahoney	1993	Children	xxs	95	Good	3-4	0	NS			2	NS	Post
1	American Samoa	Mahoney	1993	Children	xxs	386	Good	6-11	2	NS			13.7	NS	Post
2	Cambodia	Thuring	1993	Adults	xxs	305	Reasonable	15-60	8	NS	61		17		Recommend
2	Cambodia	Thuring	1993	Children	xxs	200	Poor	0-15	9	NS			4		Recommend
3	China[e]	Xiao	1990	Pop of Hunan Province	xxs	3089	Good	1-60+	17.87	ELISA	48.02	ELISA	73.03	ELISA	n/c
4	China	Seiji	1991	Adults	xxs	968	Good	15-60	3.7	RIA			37.7	RIA	n/c
5	China	Seiji	1991	Adults	xxs	1075	Reas-Good	16-60	8.2	RIA			53.6	RIA	n/c
6	China (Taiwan)	Tsai	1991	Blood donors	xxs	1135	Reasonable	18-60	4.5	EIA					n/c
7	China (Taiwan)	Tsen	1991	Children	xxs	1134	Reas-Good	0-15	4.8	RIA			14.8	RIA	Post
7	China (Taiwan)	Tsen	1991	Children	xxs	400	Reas-Good	< 5	2.0	RIA			7.4	RIA	Post
8	China[e]	Fen	1992	Pop of Xiyang	xxs	471	Reasonable	0-50	10.19	ELISA			19.11	ELISA	n/c
9	China[e]	Luo	1992	Pop of Guandong	xxs	2233	Reasonable	0-96	10.6	ELISA			24.8	ELISA	n/c
10	China	Tao	1992	General pop	xxs	438	Reas-Good	1-60+	2.5	RPHA					n/c
11	China[e]	Luo	1993	General pop	xxs	2042	Reasonable	Unknown	14.35	RIA			24.19	RIA	n/c
12	China (Taiwan)	Wang	1993	Adolescents	xxs	875	Good	13-16	18.9	EIA					Recommend
13	China (Taiwan)	Lin	1994	Pregnant women	xxs	11814	Good	21-40	12.5	EIA	37	EIA			n/c
14	China (Hong Kong)	Marshall	1995	University students	xxs	3569	Reas-Good	Unknown	3.6	NS					Prior
15	China (Taiwan)	Chen	1996	Children	xxs	1515	Good	< 12	1.3	RIA			4.0	RIA	Post
16	China	Wu	1996	General pop	xxs	1591	Good	1-59	6.3	EIA			35.6	EIA	n/c
17	China (Hong Kong)	Kwan	1997	Pregnant women	xxs	2480	Good	16-44	10	NS					Concurrent
18	China (Hong Kong)	Chan	2002	Patients with cryptogenic liver cirrhosis	xxs	28	Poor	Unknown					17.9	EIA	n/c
18	China (Hong Kong)	Chan	2002	General pop	xxs	49	Poor	Unknown					10.2	EIA	n/c
19	China[e]	Lin	1997	Children	cos	2027	Reasonable	1-16	2.22	RIA			7.82	RIA	Post
20	China	Shimbo	1997	Urban female pop	xxs	50	Poor-Reason	21-55	10	EIA			42	RIA	n/c
20	China	Shimbo	1997	Rural female pop	xxs	50	Poor-Reason	21-55	6	EIA			54	RIA	n/c
21	China[e]	Li	1998	General pop	xxs	3809	Good	1-59	17.25	RIA	8.42	EIA	68.58	RIA	Recommend
22	China	Shimbo	1998	Urban female pop	xxs	50	Poor-Reason	21-55	2	EIA			48	RIA	n/c
22	China	Shimbo	1998	Rural female pop	xxs	99	Poor-Reason	21-55	8	EIA			63	RIA	n/c
23	China	Zhang	1998	Urban college students	xxs	1557	Good	17-22	6.3	ELISA					n/c
23	China	Zhang	1998	Rural college students	xxs	1368	Good	17-22	10.8	ELISA					n/c
24	China (Taiwan)	Hsu	1999	Children	xxs	1500	Good	6	1.7	RIA					Post
25	China (Taiwan)	Wang	1999	Adults	xxs	459	Poor-Reason	> 20	32.6	IA					n/c
26	China (Taiwan)	Dai	2000	Adults	xxs	200	Poor-Reason	22-79	28	ELISA					n/c
27	China (Taiwan)	Lin	2000	Aboriginal pop	xxs	1680	Good	0-70+	14.8	EIA					n/c
28	China	Qu	2000	Females	xxs	494	Reasonable	20-62	8.1	RIA			55	RIA	n/c
29	China	Zhang	2000	Urban female pop	xxs	50	Reasonable	25-58	12	EIA			46	RIA	n/c
29	China	Zhang	2000	Rural female pop	xxs	50	Reasonable	21-61	6	EIA			44	RIA	n/c
30	China (Taiwan)	Wang	2002	Pop of A-Lien	xxs	6095	Poor	35+	13.8	EIA					n/c
31	China (Taiwan)	Lin	2003	Pregnant women	xxs	43076	Good	Unknown	12.0	RIA	29.5	RIA			n/c
32	China[c]	Wang	2006	Injection drug users	xxs	2025	Poor-Reason	Unknown	14.5	ELISA					n/c
33	China (Taiwan)	Chang	2007	College freshmen born after July 1, 1984	xxs	1204	Good	21-54	7.4	MEIA			23.5	MEIA	Post
33	China (Taiwan)	Chang	2007	College freshmen born before July 1, 1984	xxs	6388	Good	16-20	2.2	MEIA			6.7	MEIA	Post
34	China (Taiwan)	Huang	2007	Immunized children	xxs	2451	Poor-Reason	3-15	3.8	RIA					Post
35	China (Taiwan)	Lin	2007	Male IV drug users	xxs	1655	Poor-Reason	20-67	22.2	RIA					n/c
36	China	Ma	2007	Men who have sex with men	xxs	1292	Poor-Reason	16+	8.2	ELISA					n/c
37	China	Hsing	2008	Biliary tract cancer patients	xxs	417	Reasonable	Unknown	9.8	EIA			77.5	ELISA	n/c
37	China	Hsing	2008	Biliary stones patients	xxs	517	Reasonable	Unknown	9.7	EIA			71.1	ELISA	n/c
37	China	Hsing	2008	Healthy controls	xxs	762	Reasonable	Unknown	7.3	EIA			73.8	ELISA	n/c

38	China (Taiwan)	Lin	2008	Pregnant Cambodian women	xxs	42	Poor-Reason	Unknown	9.5	MEIA					Concurrent
38	China (Taiwan)	Lin	2008	Pregnant Filipino women	xxs	71	Poor-Reason	Unknown	9.9	MEIA					Concurrent
38	China (Taiwan)	Lin	2008	Pregnant Indonesian women	xxs	171	Poor-Reason	Unknown	8.8	MEIA					Concurrent
38	China (Taiwan)	Lin	2008	Pregnant Taiwanese women	xxs	10327	Poor-Reason	Unknown	15.5	MEIA					Concurrent
38	China (Taiwan)	Lin	2008	Pregnant Thai women	xxs	20	Poor-Reason	Unknown	5.0	MEIA					Concurrent
38	China (Taiwan)	Lin	2008	Pregnant Vietnamese women	xxs	1114	Poor-Reason	Unknown	8.9	MEIA					Concurrent
39	China[c]	Qian	2008	General pop	xxs	3744	Reas-Good	Unknown	4.5	ELISA			51.4	ELISA	Post
40	China (Taiwan)	Chu	2009	Male non-injection drug users in detox	xxs	561	Good	16-57	16.9	MEIA					Post
40	China (Taiwan)	Chu	2009	Male injection drug users in detox	xxs	192	Good	19-55	16.7	MEIA					Post
41	China	Fang	2009	General pop	xxs	359	Poor-Reason	15-82					11.7	ELISA	Recommend
41	China	Fang	2009	Cryptogenic chronic liver disease patients	xxs	159	Poor-Reason	25-74					47.2	ELISA	Recommend
41	China	Fang	2009	Hepatocellular carcinoma patients	xxs	135	Poor-Reason	35-70					72.6	ELISA	Recommend
42	China (Taiwan)	Mu	2009	Vaccinated, HBsAg negative children	xxs	43	Poor-Reason	1-12					6.5	ELISA	n/c
43	Fiji	Wilson	2000	Immunized pre-school children	xxs	326429	Good	1-2	.7	NS			77.0	NS	Post
43	Fiji	Wilson	2000	Mothers of immunized children	xxs	292273	Good	Unknown	6.6	NS	70.6	NS	57.9	NS	Post
43	Fiji	Wilson	2000	Unimmunized students	xxs	294029	Good	10-13	6.9	NS			39.9	NS	Post
44	French Polynesia	Boutin	1990	General pop	xxs	957	Good	0-60+	10.5	ELISA	19.3	ELISA			Prior
43	Kiribati	Wilson	2000	Immunized pre-school children	xxs	216078	Good	1-2	3.8	NS			12.8	NS	Post
43	Kiribati	Wilson	2000	Mothers of pre-school children	xxs	179993	Good	Unknown	15.1	NS	47.8	NS	89.4	NS	Post
43	Kiribati	Wilson	2000	Unimmunized children	xxs	135529	Good	10-13	27.4	NS			92.6	NS	Prior
44	Mongolia	Fujioka	1998	Outpatients	xxs	150	Reasonable	Unknown	29	CIA					n/c
45	Mongolia	Tsatsralt-Od	2005	Blood donors	xxs	403	Poor-Reason	18-66	7.4	RPHA	26.7	EIA	66.7	PHA	n/c
46	Mongolia	Davaalkham	2007	General children pop	xxs	1145	Good	7-12	5.2	CLIA			15.6	CLIA	Post
47	Mongolia	Tsatsralt-Od	2007	General children pop	xxs	655	Poor-Reason	0-15	7.2	ELISA			19.1	PHA	Recommend
48	Papua New Guinea	Sapuri	1991	Newborns	xxs	100	Poor-Reason	<1	5	RPHA					Recommend
48	Papua New Guinea	Sapuri	1991	Pregnant women	xxs	100	Poor-Reason	Unknown	11	RPHA					Recommend
49	Papua New Guinea	Spooner	1990	Pregnant women	xxs	146	Reas-Good	16-38	14	EIA	32	EIA			Recommend
50	Papua New Guinea	Sanders	1992	Females	xxs	106	Poor	20-50	36.8	EIA	17.9	EIA	0	EIA	Post
50	Papua New Guinea	Sanders	1992	Children	xxs	56	Poor	6-18	46	EIA	65	EIA	0	EIA	Post
51	Papua New Guinea	Nemba	1993	Newborns	xxs	50	Good	< 1	4	RPHA					Recommend
51	Papua New Guinea	Nemba	1993	Children	xxs	415	Good	0-4	16.7	RPHA					Recommend
52	Papua New Guinea	Yamaguchi	1993	Adults	xxs	723	Reasonable	18-65	11.9	ELISA & RPHA					n/c
53	Philippines	Arguillas	1991	Blood donors	xxs	392	Reasonable	18-58	2.2	RPHA					n/c
53	Philippines	Arguillas	1991	Medical personnel	xxs	123	Reasonable	20-53	6.5	RPHA					n/c
54	Philippines	Richards	1996	Pregnant women	xxs	502	Reasonable	19-43	5.6	RIA	25	RIA			Recommend
55	Philippines	Subida	1997	Females	xxs	50	Poor	21-59	0	EIA	0	EIA	4	RIA	n/c
56	Solomon Islands	Furusyo	1999	Outpatients and blood donors	xxs	1610	Reasonable	0-80	19.6	EIA	41.3	RIA	79.4	RIA	n/c
57	Solomon Islands	Lucas	1999	Blood donors	xxs	598	Reasonable	Unknown	25.1	NS			84.4	NS	n/c
58	Solomon Islands	Utsumi	2007	Melanesian and Micronesian general pop	xxs	564	Poor-Reason	18-60+	21.5	RPHA	21.5	EIA			n/c
59	South Korea	Kim	2007	Patients with normal serum ALT levels	xxs	195	Poor	15-94					51	MEIA	n/c
60	South Korea	Park	2008	B-cell non-hodgkin's lymphoma patients	xxs	235	Reasonable	2-82	14	ELISA					n/c
60	South Korea	Park	2008	Hospital matched controls	xxs	235	Reasonable	20-88	8.1	ELISA					n/c

Appendix B (*Continued*)

	Country	Source	Source Year	Population studied	Study design[a]	Sample size	Study quality	Age range	HBsAg prevalence (%)	Testing Method Used	HBeAg prevalence[b] (%)	Testing Method Used	Anti-HBc prevalence[c] (%)	Testing Method Used	Vaccination Intervention[d]
61	South Korea	Song	2009	General pop	xxs	1091	Poor-Reason	Unknown	4.0	NS			39.3	NS	n/c
43	Tonga	Wilson	2000	Immunized pre-school children	xxs	216078	Good	1-2	3.8	NS			12.3	NS	Post
43	Tonga	Wilson	2000	Mothers of immunized children	xxs	216209	Good	Unknown	18.6	NS	47.5	NS	84.7	NS	Post
43	Tonga	Wilson	2000	Unimmunized children	xxs	227252	Good	10-13	11.1	NS			45	NS	Post
62	Vanuatu	Maher	1991	Children-group A	xxs	112	Good	1-1.5	17	EIA	73.7	EIA			Recommend
62	Vanuatu	Maher	1991	Mothers of group A children	xxs	110	Reas-Good	Unknown	24.5	EIA	48.1	EIA			Recommend
62	Vanuatu	Maher	1991	Children- group B	xxs	176	Good	2.5-3.5	30.1	EIA	84.9	EIA			Recommend
62	Vanuatu	Maher	1991	Children- group C	xxs	194	Good	4.5-9.5	29.9	EIA	79.3	EIA			Recommend
43	Vanuatu	Wilson	2000	Immunized pre-school children	xxs	137733	Good	1-2	3.0	NS			9.3	NS	Post
43	Vanuatu	Wilson	2000	Mothers of immunized children	xxs	131138	Good	Unknown	12.3	NS	50	NS	65.4	NS	Post
43	Vanuatu	Wilson	2000	Unimmunized students	xxs	135797	Good	10-13	16.3	NS			54.1	NS	Post
63	Viet Nam	Tran	1993	Adults- Blood donors	xxs	32300	Reasonable	17-50	9.5	ELISA					n/c
63	Viet Nam	Tran	1993	Pregnant women	xxs	1000	Reasonable	18-41	9.9	ELISA					n/c
64	Viet Nam	Nakata	1994	General pop	xxs	1343	Reasonable	Unknown	13.3	PHA					n/c
65	Viet Nam	Song	1994	Blood donors from Ho Chi Minh	xxs	491	Good	Unknown	3.1	PHA					n/c
65	Viet Nam	Song	1994	Blood donors from Hanoi	xxs	499	Good	Unknown	3	PHA					n/c
66	Viet Nam	Katelaris	1995	Children	xxs	87	Reasonable	2-12	19.5	EIA					Recommend
67	Viet Nam	Kakumu	1998	General pop	xxs	890	Reas-Good	2-81	5.7	RPHA					n/c
68	Viet Nam	Barcus	2002	Severe malaria patients	xxs	324	Reas-Good	Unknown	23.8	ELISA					n/c

Note: The number of population estimates of prevalence for the selected serological markers of Hepatitis B virus infection and immunity reflected in this table are: 736 for all ages, 81 for adults, 111 for blood/tissue donors, 110 for pregnant women, 119 for children, 85 for patients, and 116 for other populations; 687 involving HBsAg seroprevalence estimates, 327 involving Anti-HBc, and 107 involving HBeAg.

[a] Study design abbreviation are as follows: xxs stands for cross sectional study, ccs stands for case-control study, and cos stands for cohort study.

[b] HBeAg prevalence is restricted to HBsAg positive individuals.

[c] Anti-HBc prevalence is based on persons with positive Anti-HBc in the total sample.

[d] For the purpose of this paper, vaccination intervention was categorized into the following five areas: 1) n/c, meaning no comment was made about vaccination interventions in the article, 2) Prior, meaning the purpose of the study was to establish baseline data for a vaccination intervention, 3) Post, meaning the purpose of the study was to evaluate a vaccination intervention, 4) Recommend, meaning the article recommended that vaccination interventions should be a priority based on study results, and 5) Concurrent, meaning that study results were partially attributed to ongoing vaccination interventions.

[e] Non-English papers.

Testing Method abbreviations are as follows: CIA- counting immunoassay; CIEP- counterimmunoelectrophoresis technique; CLIA – Chemiluminescent immunoassay; EIA- enzyme immunoassay; ELISA- enzyme linked immunosorbent assay; HI- hemagglutination inhibition; IA- immunoenzymatic assay; IC – immunochomatography assay LATEX- latex agglutination; MEIA- microparticle enzyme immunoassay; MELISA- microelisa NS- not specified or not available; PA- particle agglutination; PHA- passive hemagglutination; RPHA- reverse passive hemagglutination; RIA- radioimmunoassay.

Appendix C. References for Table in Appendix A by WHO sub-region

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Appendix D Figures 1–4

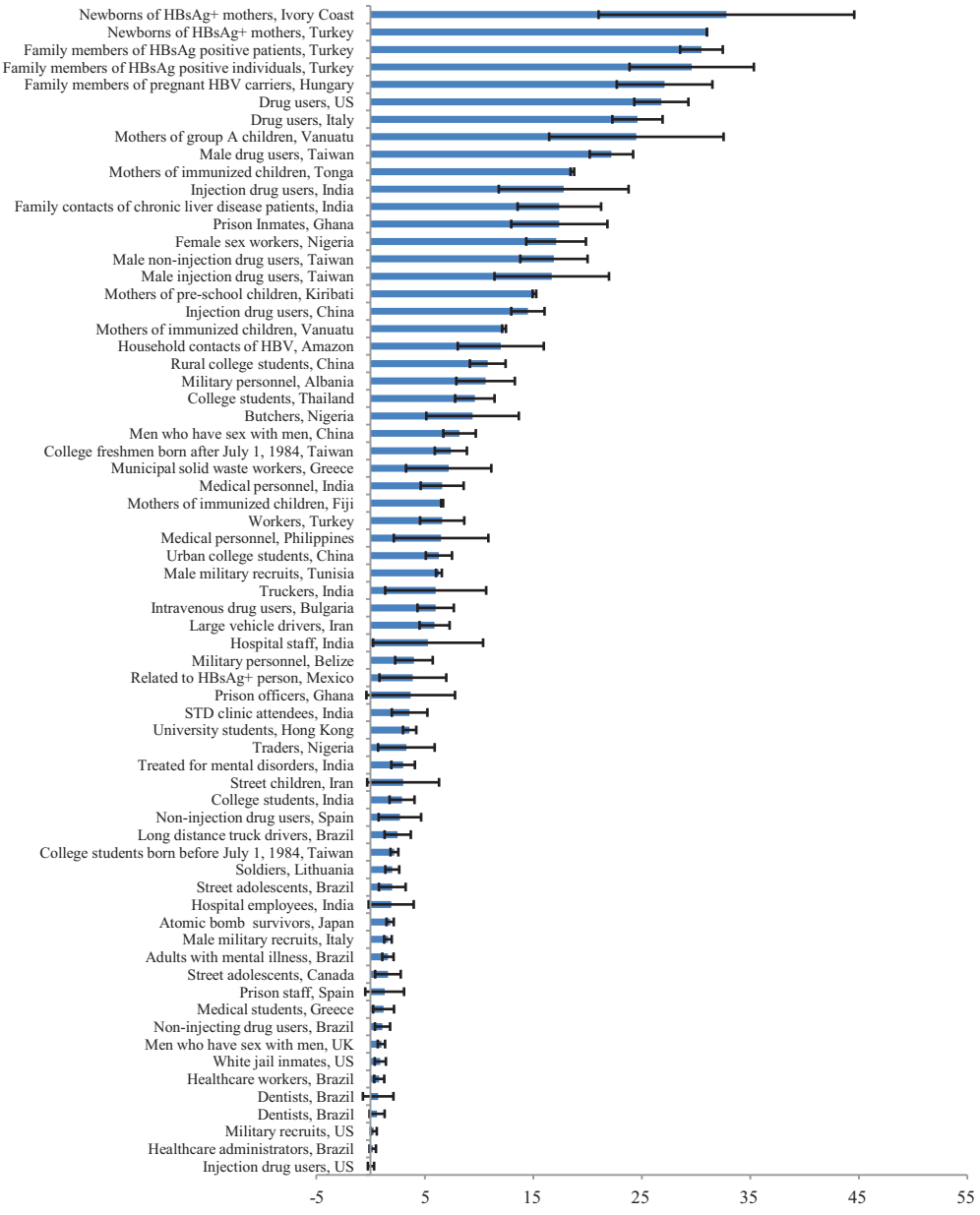

Figure 1. Median seroprevalence of HBsAg (%) among selected groups.

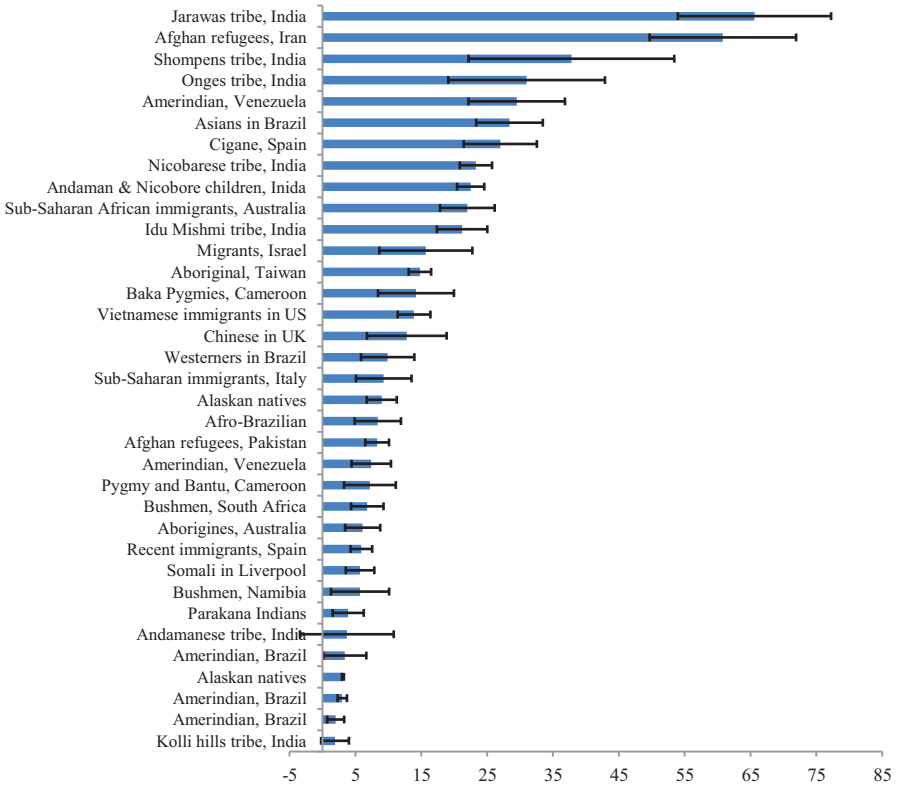

Figure 2. Median seroprevalence of HBsAg (%) among special populations.

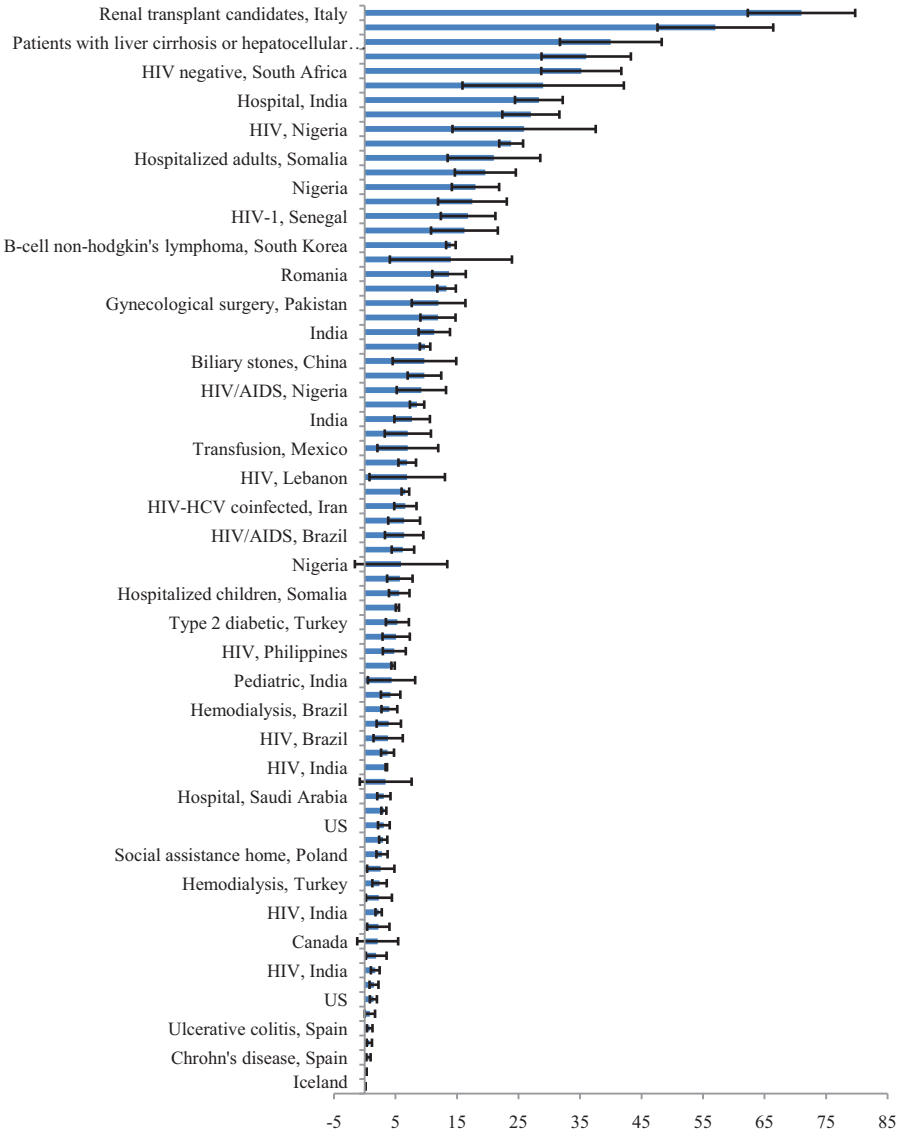

Figure 3. Median seroprevalence of HBsAg (%) in patients.

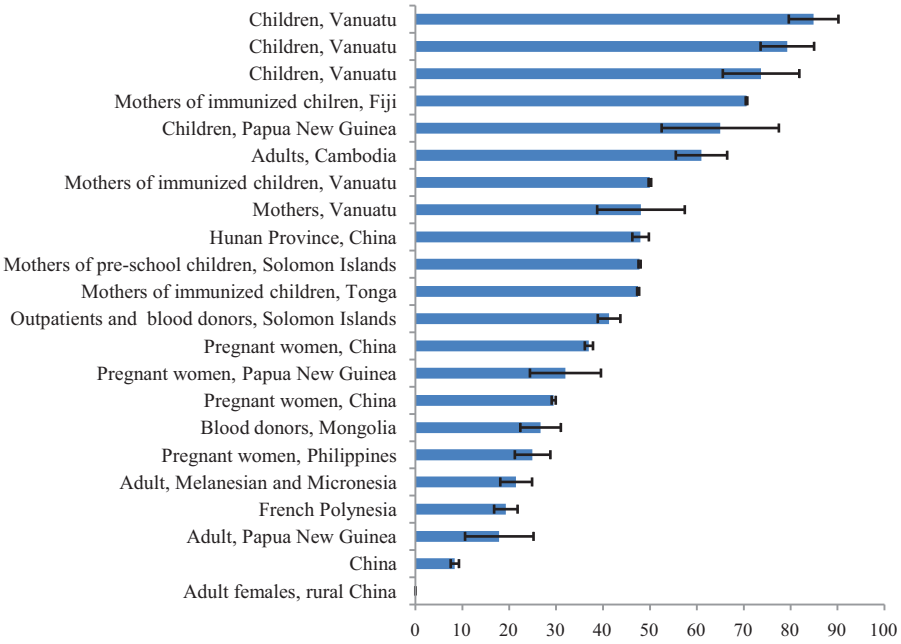

Figure 4. Median seroprevalence of HBeAg (%) for studies conducted within the WHO sub-region WPR-B.

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